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2079

Updates to the documentation system for R

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OBJECTIVES/SPECIFIC AIMS: This research seeks to create a next generation documentation system that exists independent of but is complimentary to the packaging system in R. The new documentation can be manipulated programmatically as with all R objects. It also implements multiple translators for creating documentation from different sources, including documentation pages written in latex and code comments. METHODS/STUDY POPULATION: This work is based on input from the R Documentation Task Force, which is a working group, supported by the R Consortium and the University of Utah Center for Clinical and Translational Science, consisting of R Core developers, representatives from the R Consortium member companies and community developers with relevant interest in documentation. An abstraction of the documentation currently in use was created and extended. This abstraction was translated to a class system in R so that documentation can be stored and manipulated in R. RESULTS/ANTICIPATED RESULTS: The class system representing the documentation and the tools for creating the translators are currently being implemented in R. A preview of the system is scheduled to be available at the time of the conference. DISCUSSION/SIGNIFICANCE OF IMPACT: Good documentation is critical for researchers to disseminate computational research methods, either internally or externally to their organization. This work will facilitate the creation of documentation by making documentation immediately accessible and promote documentation consumption through multiple outputs which can be implemented by developers.

2109

Interleukin 4-induced protein 1 as a biomarker and treatment option in multiple sclerosis

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OBJECTIVES/SPECIFIC AIMS: The overall objective of this proposal is to establish and modulate the inflammatory profile of individuals across the spectrum of multiple sclerosis (MS), with a focus on determining the potential of interleukin 4-induced protein 1 (IL4I1) as a possible marker of progression and modulator of inflammation in human blood samples. METHODS/STUDY POPULATION: The proposed experimental approach involves isolating plasma and peripheral blood mononuclear cells (PBMCs) from individuals across the spectrum of MS phenotypes, and analyzing these samples primarily by quantitative polymerase chain reaction (qPCR) and enzyme-linked immunosorbent assay (ELISA) methods. Specifically, study groups include: (1) actively relapsing-remitting MS (a-RRMS), (2) non-actively relapsing-remitting MS (n-RRMS), (3) non-active secondary-progressive MS (SPMS), (4) other autoimmune diseases (OAD), (5) healthy controls (HC). RESULTS/ANTICIPATED RESULTS: We expect that IL4I1 treatment increases regulatory cytokine (eg, IL10, TGFb) expression while decreasing Th1 and Th17-derived cytokines (IFNg, IL17), as well as increasing relative composition of regulatory cells (Th2, Treg, M2) as compared with Th1, Th17, M1 (aim 1). Preliminary data on healthy control cells support this prediction. Our central hypothesis is that IL4I1 level indicates the body's ability to repair itself. As such, we anticipate that all MS groups are deficient in IL4I1, to varying degrees, such that HC > n-RRMS > a-RRMS > SPMS. HC have full repair capacity. RRMS > SPMS as remission indicates existent repair capacity, which is lost in SPMS. n-RRMS > a-RRMS since both, as RRMS, capable of repair response, but a-RRMS triggered this response more recently in response to more recent relapse. In all groups, we expect IL4I-treatment to mitigate inflammation (aim 2). Finally, we expect that H_2O_2 production by IL4I1 is a key player in IL4I1 function, and that H2O2 will preferentially induce oxidative stress to pro-inflammatory subsets of PBCMs (aim 3). DISCUSSION/SIGNIFICANCE OF IMPACT: MS is a chronic inflammatory neurodegenerative disease of the central nervous system that, with an average age of onset of 34, afflicts over 2.3 million individuals worldwide during many of the most productive years of their lives. The pathogenesis of MS, which involves autoimmune destruction of myelin, is poorly understood. Accurate biomarkers, which could predict disease progression, are yet to be identified and would provide valuable information to patients and their treating clinicians. Likewise, effective treatments are few and in high demand. IL4I1 is a promising candidate for both roles.

2120

Antipsychotic-induced weight gain arises, in part, from alteration of feeding circuitry in the lateral hypothalamic area

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OBJECTIVES/SPECIFIC AIMS: To demonstrate that olanzapine recapitulates the effect of increased lateral hypothalamic (LH) GABAergic activity in the DRN and the DBB. This will provide a potential neural substrate for the observed increase in consumption of food and weight gain. METHODS/STUDY POPULATION: (1) We will examine electrophysiological activity of the DRN and the DBB in response to optogenetic stimulation of LH fibers to these nuclei. (2) We will identify the behavioral phenotype of stimulating these same projections using optogenetic techniques. (3a) Identify the behavioral phenotype of mice possessing cre-loxp-dependent knockout (KO) of LH GABAergic activity, DRN serotonergic activity, and inhibition of DBB cholinergic activity. (3b) Using these mice, we will establish behavioral response to olanzapine in ad libitum feeding and fast-refeeding condition. (4) Using baseline and post-treatment body mass index (BMI), PANSS, and side effect profile scores from a recently completed prospective cohort study of treatment-naive schizophrenic patients receiving atypical antipsychotics for 1 year, we will sequence multiple single nucleotide polymorphisms and explore the correlation of serotonergic, dopaminergic, and cholinergic receptor mutations with the increase in BMI and changes in PANSS score and side effect scores. RESULTS/ANTICIPATED RESULTS: (1) Our preliminary data indicates that the LH exclusively sends GABAergic input to the DBB, and the large majority of its projections to the DRN are GABAergic. (2) We have identified that stimulating LH– > DBB projections produces intense feeding and drinking behavior, a real-time place preference for laser stimulation, and a conditioned place preference for laser stimulation. Preliminary data shows that the LH- > DRN also produces feeding behavior. (3a) Our lab has demonstrated that transgenic mice with LH-specific GABA release KO are smaller, have increased anxiety-like behaviors such a repetitive grooming and open field aversion, and have reduced feeding after fasting conditions. We expect the DRN serotonergic KO mice to have increased body weight and reduced anxiety-like behaviors. (3b) Our pilot study demonstrated that the LH GABA KO mice administered olanzapine have a greater consumption of food over 1 hour than controls ($n = 7$, 5, respectively; $p = 0.08$). DRN serotonergic KO mice and mice with inhibition of choline will have an increased baseline feeding behavior, but will not be affected by olanzapine. (4) We believe that SNPs in serotonergic receptors such as 5HT2C, and those affecting dopaminergic and cholinergic receptors, will be more common in schizophrenic patients with increased BMI than those without. Further, we believe that a reduction in the PANSS items reflecting anxiety and aversiveness will correlate with increased BMI, since we

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postulate that mimicking LH GABAergic activity will produce its previously demonstrated anxiolytic effects. DISCUSSION/SIGNIFICANCE OF IMPACT: Identifying the important role for a reward-oriented feeding center in the brain in producing antipsychotic weight gain will allow a more comprehensive, ethologically sound approach to behavioral modification therapy in these patients. It will lend mechanistic credence to weight control therapies which have used token economy, opioid antagonism, and other inhibition-promoting therapies. This study will also increase the validity for testing further the use of selective serotonin agonists which prevent weight gain such as lorcaserin.

2153

Innovative 3D printed intravaginal rings for contraception and HIV prevention

Rahima Benhabbour, Rima Janusziewicz, Sue J. Mecham, Roopali Shrivastava and Gayane Paravyan

OBJECTIVES/SPECIFIC AIMS: The long-term goal of this project is to develop a cost effective 3D printed multipurpose intravaginal ring (IVR) to prevent against unintended pregnancies and infectious diseases.Our goal is to develop a female-controlled method for prevention using innovative IVRs. METHODS/STUDY POPULATION: In vitro and in vivo characterization. RESULTS/ANTICIPATED RESULTS: Controlled and fine-tuned release kinetics 100% drug release from 3D printed IVRs compared with 10%–15% with traditional injection molded IVRs cost-effective engineering of multipurpose IVR with CLIP 3D printing technology. DISCUSSION/SIGNIFICANCE OF IMPACT: If successful, this project will revolutionize the engineering of IVRs and will have a global impact on human health. Not only we will help save millions of women around the world but also millions of children that are infected by their HIV-positive mothers through gestation or breast feeding.

2169

Hydrogen bonding and water accessibility changes upon expansion of PolyQ tracts in ataxin-2 and ataxin-3

Jingran Wen, Daniel Scoles and Julio C. Facelli

OBJECTIVES/SPECIFIC AIMS: Polyglutamine (polyQ) neurodegenerative diseases, associated with the unstable expansion of polyQ tracts, are devastating diseases for which no treatments exist. Moreover, most drug discovery attempts have been hindered by the lack of understanding on the relevant pathogenic mechanisms. Here, using previously reported 3D protein predicted structures of ataxin-2 and ataxin-3, we analyze the effect of polyQ enlargement on hydrogen bonding and water accessibility patterns as a possible mechanism for pathogenesis thought enhanced protein aggregation. METHODS/STUDY POPULATION: Using the I-TASSER predicted structures of ataxin-2 and ataxin-3 with different numbers of glutamine repeats representing polyQ lengths characteristic of both normal and pathological tracts (*Journal of Biomolecular Structure and Dynamics*, 2016: 1–16), we identified hydrogen bonds (HBs, UCSF Chimera FindHBond module) and calculated solvent-accessible surface areas (SASA, DSSP program) for the polyQ tracts available in the 3D structures. RESULTS/ANTICIPATED RESULTS: The identified HBs were analyzed as the function of the number of glutamines in the polyQ tracts and characterized as those intra-polyQ and exter-polyQ, respectively. The SASA of the polyQ region was also studied as the function of the polyQ tract length. DISCUSSION/SIGNIFICANCE OF IMPACT: The results obtained here indicate that polyQ regions increasingly prefer self-interactions, which consistently can lead to more compact polyQ structures. The results strongly support the notion that the expansion of the polyQ region can be an intrinsic force leading to self-aggregation of polyglutamine proteins and suggest that the modulation of solvent-polyQ interactions could be a possible therapeutic strategy for polyQ diseases.

2173

Investigation of sAC signaling reveals new therapeutic targets for cancer cell metabolism

Jenny Wang and Jonathan Zippin

OBJECTIVES/SPECIFIC AIMS: The soluble adenylyl cyclase (sAC) is a noncanonical source of cAMP in mammalian cells. sAC is an ATP/bicarbonate ion sensor, whose activity responds to intracellular signals such as pH changes and metabolism. Unlike the more traditionally studied transmembrane adenylyl cyclase, sAC is not tethered to the cell membrane and instead is found in subcellular microdomains like the mitochondria and nucleus. In particular, sAC localization in the mitochondria has been implicated in oxidative phosphorylation and mitochondrial metabolism. Specific changes in sAC microdomain localization have diagnostic utility in a wide variety of cancers, namely melanoma. We have recently found that loss of sAC leads to tumorigenesis and a Warburg/cancer-like metabolic phenotype, consisting of an activated flux through glycolysis, increased lactate production, and dependence on glucose metabolism. In addition, computational analysis of the metabolomics profile of sAC null cells suggests an increased flux through serine synthetic pathways. We hypothesized that specific sAC microdomains are responsible for this cancer-like metabolic state. METHODS/STUDY POPULATION: We have established oncogenic SV40 large T antigen and HPV16-E6 expressing mouse embryonic fibroblasts lacking sAC expression (SV40 KO and E6 KO, respectively). Using these parental lines, we reintroduced sAC by targeting the protein to specific microdomains. sAC was either driven into the mitochondria (mito-sAC) or was driven into all possible microdomains (WT sAC). Single clones were generated and sAC expression was confirmed by Western analysis. Stable cell lines were evaluated for mitochondrial metabolism, glucose sensitivity, and serine sensitivity. RESULTS/ANTICIPATED RESULTS: We found that reintroduction of WT sAC into sAC null cells rescued sensitivity to glycolytic inhibition compared with control cells ($p < 0.01$). The effect was not dependent on the method of immortalization as it was seen in both SV40 and E6 KO cell lines. sAC activity was not directly proportional to expression suggesting that additional regulatory pathways exist. Interestingly, targeted delivery of sAC to the mitochondria was not as effective in rescuing glucose sensitivity as untargeted delivery of sAC into all possible microdomains. Therefore, even though mitochondrial sAC is known to influence metabolism, our data suggests that the nonmitochondrial isoform is most important for cancer cell metabolism. Although metabolomics analysis suggested that serine synthetic pathways are activated in sAC null cells, there is no evidence to suggest that serine is required for sAC null cell growth. Neither inhibition of serine synthesis nor serine starvation differentially affected the growth of sAC null cells compared with WT sAC. DISCUSSION/SIGNIFICANCE OF IMPACT: These data suggest that the Warburg metabolic phenotype in sAC null cells is regulated by specific sAC microdomains. By targeting sAC to specific microdomains, we can further distinguish the role of sAC localization in cellular metabolism. Cancer cells have been shown to exhibit altered metabolic circuitry of pathways like glycolysis, which allow them to adapt to increased metabolic demands of cellular proliferation and waning environmental resources. Beyond helping us improve the use of sAC immunolocalization as a cancer diagnostic, a better understanding of sAC microdomains in transformed cells will help us understand how this signaling pathway is important in cancer. Pharmacologic manipulation of sAC signaling may represent a new cancer therapeutic strategy.

2174

In silico prediction of NS1 structure and influenza A virus pathogenesis

Joshua Klonoski and Julio C. Facelli

OBJECTIVES/SPECIFIC AIMS: This poster presents preliminary results of using in silico approaches to predict a priori, based on sequence alone, the pathogenesis of novel influenza A virus. METHODS/STUDY POPULATION: Here we analyzed the structure of the NS1 protein of 11 strains of well characterized influenza A virus with known pathogenesis, reported in the literature as LD50 values, and published sequences. We performed homology comparison of these sequences using the ExPASy SIM alignment tool for protein sequences and then predicted their 3D structures using the I-TASSER method for protein structure prediction. We retained the best 20 I-TASSER models for the NS1 sequences considered here and compared their structures with that of the X-ray crystallographic structure of the NS1 protein in the A/blue-winged teal/MN/993/1980 (H6N6). The average RMS between this experimental structure and the best 20 I-TASSER models was used as a measure of structural similarity between the 3D structures among the proteins. RESULTS/ANTICIPATED RESULTS: The sequence homology shows modest correlation between sequence and pathogenicity. Linear correlations with R values as large as 0.6 where observed for the full sequence homology and the homology of the RBD domains of the proteins. The correlations with the other protein domains were significant lower. We did not found overall correlation between the 3D structures and pathogenesis of all the variants considered here, but the initial results suggest that correlations do exists for different subgroups of viruses. In future work we will use advanced data mining methods to better understand clustering and correlation between structure and pathogenesis. DISCUSSION/SIGNIFICANCE OF IMPACT: The results presented in this poster demonstrate, as proof of concept, the use of in silico approaches to determine pathogenesis of viruses with substantial impact on human health. The ability of computationally predicting pathogenesis of rapidly mutating viruses

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can be an effective way to accelerate the development prevention strategies because computational methods are relatively inexpensive and much more scalable than in vivo approaches.

2192

Comparison of liquid Versus dry aerosol drug delivery in a 3D printed avian trachea and mainstream bronchi model

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OBJECTIVES/SPECIFIC AIMS: This study investigates the process configuration parameters involved in targeted drug delivery to the avian respiratory system. Previously, direct intratracheal aerosol delivery in an avian model using a commercial atomizer was found to result in delivery of a high portion of the total dose into one lung lobe. We hypothesize that controlling process configuration will decrease the asymmetric distribution. METHODS/STUDY POPULATION: A 3D printed model of an avian trachea and mainstream bronchi was constructed to create a representative model for direct instillation of aerosols. Construction of the model respiratory tract included the trachea and the first mainstream bronchi bifurcation to measure left/right (L/R) distribution of aerosol delivered. Both liquid aerosol delivery (LAD) using a commercial atomizer and dry aerosol delivery (DAD) using a custom-built dry powder insufflator device were tested. Two experimental variables were controlled: (1) retraction distance from the carina and (2) centering of device shaft in the lumen of the trachea. Measurement of device efficiency (dose delivered to the 3D model at as fraction of total dose), aerosol delivery efficiency (dose captured at L/R bifurcations as a fraction of total dose), and aerosol lateralization (L/R) was conducted. RESULTS/ANTICIPATED RESULTS: The aerosol delivery efficiency for both LAD and DAD devices [73.9% (95% CI: 68.2–79.2) and 73.4% (95% CI: 55.5–91.3), respectively] did not have an appreciable difference. However, the LAD device had a higher efficiency as compared with the DAD device. The L/R distribution for the DAD device was found to be highly dependent on both retraction distance and shaft centering. Appreciable improvement in the L/R distribution was seen using the DAD device by increasing the retraction distance distal to the carina. DISCUSSION/SIGNIFICANCE OF IMPACT: The use of targeted drug delivery to treat pulmonary pathogens requires a careful design, manufacture, and therapeutic positioning of devices. In particular, clinically relevant animal models and treatment regimes requires a sound understanding of the physical processes controlling aerosol distribution in the respiratory system. By using a simulated respiratory model, many of the physical parameters of drug delivery can be tested before using a live animal model. This is especially important from an animal welfare perspective as well as an animal subject availability aspect.

2194

Effects of anoxia on viability and differentiation of human cardiosphere-derived cells

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OBJECTIVES/SPECIFIC AIMS: A major limitation of cardiac stem cell transplantation following myocardial infarction (MI) is poor retention of cells in the ischemic microenvironment. Our study aims to better understand and promote the survival and differentiation of human cardiosphere-derived cells (hCDCs) in anoxia, a feature of infarcted myocardium. METHODS/STUDY POPULATION: We previously demonstrated that TGFβ1 and heparin-containing hydrogels (TH-hydrogel) can promote murine CDC survival. In this study, hCDCs were incubated in either normoxia or anoxia for 8 hours with and without TH-hydrogel. In addition, hCDCs without TH-hydrogel were assessed in 16 hours of anoxia. Following incubation, hCDCs were assayed for viability using calcein dye and immunostained for CD31, a marker of endothelial differentiation. RESULTS/ANTICIPATED RESULTS: hCDCs incubated for 8 hours in anoxia in both models equally demonstrated increased survival up to 30% when compared with cells incubated in normoxia. However, in contrast to hCDCs alone, hCDCs with TH-hydrogel additionally demonstrated increased differentiation into endothelial cells in both anoxia and normoxia. We found that hCDCs alone were able to upregulate CD31 only when subjected to 16 hours of anoxia. DISCUSSION/SIGNIFICANCE OF IMPACT: We demonstrate a new, previously unknown response of hCDCs to anoxia. This induces increased viability and differentiation of hCDCs into endothelial cells. The differentiation in anoxia was time dependent and could be expedited with use of TH-hydrogel. Anoxic preconditioning of hCDCs together with the TH-hydrogel system may improve the therapeutic potential of stem cell transplantation following MI.

2215

Neuropilin-2 is expressed by activated alveolar macrophages and negatively regulates allergic airway inflammation

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OBJECTIVES/SPECIFIC AIMS: Allergic asthma is a chronic lung disease driven by inappropriate inflammatory responses against inhaled allergens. Neuropilin-2 (NRP2) is a pleiotropic transmembrane receptor expressed in the lung, but its role in allergic airway inflammation is unknown. Here, we characterized NRP2 expression in lung immune cells and investigated the effects of NRP2 deficiency on airway inflammation. METHODS/STUDY POPULATION: NRP2 expression by lung immune cells from NRP2 reporter mice was determined by flow cytometry. NRP2 expression by human alveolar macrophages (AM) from healthy individuals was determined by mRNA analysis and flow cytometry. Airway inflammation in NRP2-deficient mice was assessed by bronchoalveolar lavage (BAL) cytology and inflammatory gene expression in lung tissue. RESULTS/ANTICIPATED RESULTS: NRP2 expression in lung immune cells was negligible under steady-state conditions. In contrast, inhalational exposure to lipopolysaccharide (LPS) adjuvant dramatically induced NRP2 expression in AM, as 63.3% of AM from LPS-treated mice were NRP2+ compared with 1.5% of AM from control mice. Ex vivo treatment of human AM with LPS resulted in a 1.5-fold and 2.6-fold increase in NRP2 mRNA and surface protein expression, respectively. Compared to littermate controls, NRP2-deficient mice had greater numbers of BAL leukocytes and increased lung expression of the T helper type 2 cytokines IL-4 and IL-5. Furthermore, NRP2 deficiency resulted in stochastic development of allergic airway inflammation, as spontaneous airway eosinophilia was detected in 25% (2/8) of NRP2-deficient mice compared with 0% (0/8) of littermate controls. DISCUSSION/SIGNIFICANCE OF IMPACT: NRP2 is expressed by activated human and murine AM and suppresses the spontaneous development of allergic airway inflammation. These findings suggest that NRP2 may play a key role in allergic asthma pathogenesis, and could prove to be an important therapeutic target in patients with asthma and other allergic diseases.

2217

A transgenic retinitis pigmentosa zebrafish model for drug discovery

Logan Ganzen, Chi Pui Pang, Mingzhi Zhang, Motokazu Tsujikawa and Yuk Fai Leung

OBJECTIVES/SPECIFIC AIMS: Retinitis pigmentosa (RP) is a hereditary retinal degeneration disease that affects ~1 in 4000 individuals globally, and there are currently no effective treatment options available. In order to identify potential drug treatments, we optimized our existing a behavioral assay around a transgenic zebrafish carrying a truncated human rhodopsin transgene [Tg(rho:Hsa.RH1_Q344X)]. This line was also crossed with the Tg(-3.7rho:EGFP) reporter for rod visualization. The Q344X larvae experiences significant rod photoreceptor death by 7 days postfertilization (dpf) (Nakao *et al.*, 2012). METHODS/STUDY POPULATION: To assess the vision of the Q344X zebrafish, the VMR assay was run under a dim-light condition based on recorded rod b-waves in larval fish (Moyano *et al.*, 2013) and the minimum cone activation threshold in mice (Cachafeiro *et al.*, 2010). Specifically, Q344X and control larvae at 7 dpf were placed into a 96-well plate and acclimated to a dim-light source (1.802e-05 μ W/cm^2 at 500 nm) for 1 hour. The VMR was tracked and quantified during light offset. The total distance traveled was averaged and analyzed at 1 second poststimulus. Retinas were dissected from Q344X and control larvae and whole-mounted to validate the rod degeneration in the Q344X model. RESULTS/ANTICIPATED RESULTS: We found that the Q344X larvae displayed an attenuated VMR (0.121 ± 0.041 cm) to the dim-light offset as compared with the control larvae (0.2751 ± 0.038 cm) (two-sample *t*-test; *p*-value = 4.619e-14, n = 19). Analysis of whole-mounted retinae indicated significant rod degeneration at 7 dpf compared with controls (control: 87 rods/retina, Q344X: 9.3 rods/retina, Welch two-sample *t*-test, *p*-value = 1.4e4). It is unlikely that the cones of the zebrafish contributed to this VMR since the light intensity of the assay was below the cone detection threshold of mice. As the only apparent difference between the 2 groups of larvae is significant rod degeneration, it can be concluded that the behavioral phenotype was a result of

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the degeneration. DISCUSSION/SIGNIFICANCE OF IMPACT: These results suggest that the attenuated Q344X VMR is a result of the rod photoreceptor death. This behavioral phenotype can be taken advantage of to develop a drug screening assay. Future steps will screen chemical libraries to identify compounds that ameliorate the rod degeneration. Compounds that prevent degeneration are expected to result in a significant increase in locomotion in response to the dim visual stimulus.

2229

Development of an angiogenic proteoglycan mimic to accelerate ischemic diabetic foot ulcer repair

Jenny Lin and Alyssa Panitch

OBJECTIVES/SPECIFIC AIMS: This project aims to synthesize an angiogenic decorin mimic (VEGFp-DS-SILY) with varying densities of QK and characterize its angiogenic potential and synergism with VEGF by evaluating (1) endothelial cell (EC) migration and proliferation, (2) EC VEGF receptor activation, (3) EC tubule formation in collagen scaffolds, and (4) angiogenesis from a chick chorioallantoic membrane (CAM assay) growing into the scaffold, reflecting the ability of the collagen scaffold to integrate into existing vasculature. The next main goal is to develop and characterize an MMP-degradable nanoparticle system for controlled release of VEGF. Future work will evaluate in vivo effects of VEGFp-DS-SILY bound to a 3D collagen scaffold on ischemic wound repair in a combined excisional wound/bipedical dorsal skin flap rat model. METHODS/STUDY POPULATION: Peptide hydrazides are conjugated to the free carboxylic acid functional groups on dermatan sulfate using EDC chemistry. We added a 3 amino acid spacer (-Gly-Ser-Gly) to the C-terminus of the established QK sequence before the hydrazide functional group and refer to this modified QK as "VEGFp." VEGFp, SILY, and *N*-terminal biotinylated versions were synthesized using standard Fmoc solid-phase peptide synthesis protocols and purified using reverse phase HPLC. Coupling efficiencies of peptides to dermatan sulfate were determined spectroscopically at 280 nm measuring the aromatic residues (Trp or Tyr) using a NanoDrop system. Dermatan sulfate with 1 or 4 VEGFp peptides coupled were termed DSV1 and DSV4, respectively. After further conjugation with SILY, we will blend this VEGFp-DS-SILY with unmodified DS-SILY to a total 10 μM to test increasing densities of VEGFp. To verify that the collagen-binding properties of VEGFp-DS-SILY are not compromised by the addition of VEGFp, we will use a streptavidin-HRP system to detect bound biotinylated VEGFp-DS-SILY on collagen-coated plates by established protocols. DSV1 and DSV4 were tested for their effects on endothelial VEGFR2 phosphorylation using an MSD ELISA-type assay and endothelial proliferation using an MTS assay. Cell migration was monitored using an ORIS assay where cells are grown to confluence around a silicone stopper that is then removed to allow cells to migrate inward. Tubulogenesis was evaluated by examining tubule formation on matrigel. Finally, in vivo angiogenesis will be evaluated using a chorioallantoic membrane assay. For extracellular VEGF release, hollow MMP-degradable thermoresponsive nanoparticles [NIPAM, 5 mol% 2-acrylamido-2-methyl-1-propanesulfonic acid (AMPS), 1% Acrylic Acid (AAc), 2 mol% MMP-degradable peptide diacrylate, and potassium persulfate initiator] will be synthesized around noncross-linked polymer cores. The cores will then be diffused out through the shell by dialysis prior to drug loading. SILY (and some biotinylated SILY for visualization) will be conjugated with EDC chemistry for targeting nanoparticles to collagen. NPs size and zeta-potential will be measured on a Malvern Zetasizer. VEGF will be loaded into NPs by co-incubating a loading solution of 1 μg/mL VEGF with 1 mg of NPs, incubating overnight at 4°C. VEGF loading and release will be measured by ELISA. Biological activity of the released VEGF from particles will be determined on ECs using assays similar to those outlined previously. RESULTS/ANTICIPATED RESULTS: Preliminary data have verified the synthesis and purification of SILY and VEGFp (QK-Gly-Ser-Gly-hydrazide), as well as an *N*-terminal biotinylated version, through mass spectrometry and reverse-phase HPLC, respectively. For proof-of-concept, we have verified binding of VEGFp to the VEGF receptor 2 using a ForteBio Blitz interferometry instrument. In addition to support based on published reports showing retained bioactivity of QK after conjugation using other spacers, our preliminary data suggests that VEGFp still binds to VEGF receptor 2, albeit with decreased affinity like QK as compared with VEGF. Circular dichroism also shows that VEGFp has retained its α-helical structure necessary for bioactivity; however it appears that it has some uncoiling when conjugated to dermatan sulfate. We hypothesize that varying densities of VEGFp conjugated to the decorin mimetic (DS-SILY) will modulate the degree of angiogenic activity and synergy with VEGF. We determined that we can achieve ~70% VEGFp conjugation completion to dermatan sulfate after 3.5 hours. We have quantified VEGFR2 phosphorylation after 5 minute treatments by using phospho-specific antibodies and an ELISA-type protocol in a mesoscale discovery system. Preliminary data with human umbilical vein endothelial cells shows that VEGFp exhibits synergism with VEGF at levels similar to QK. DSV1 and DSV4 data suggests synergy with VEGF, although free-peptides and engineered compounds alone did not show effects similar to VEGF in the conditions tested. Prelminary data with 30 minute treatments suggests that the peptides and compounds may require longer exposures to induce activation, as they may have slower binding rates. In contrast, prolonged stimulation with VEGF causes a sharp increase in receptor activation, peaking around 10 minutes and decreasing significantly by 30 minutes. Peptides QK and VEGFp both slightly increased proliferation of dermal microvascular endothelial cells (HMVECs) after 60 hours incubation. However, incubation with dermatan sulfate and DSV caused significant cell death after 24 hours in reduced growth factor media, likely due to sequestering of growth factors. It is possible that VEGFp-DS-SILY may better stimulate proliferation since it would be presented as a surface bound proteoglycan mimic, rather than as a soluble factor. HMVECs migrated farther for all treatment groups (10 μM QK, 10 μM VEGFp, 1 μM DSV4, and 10 μM DSV4) than the 10 ng/mL VEGF positive control, although more cells migrated in response to VEGF. This may be accounted at least in part by the more pronounced proliferation induced by VEGF. Migration will also be tested in 3D culture within a collagen gel. We are currently testing a 2D matrigel system for tubulogenesis. We have found that 10 μM DSV4 forms qualitatively more well-defined tubules than the untreated control on reduced growth factor matrigel. However, we were not able to quantify the improved tubule formation and are still troubleshooting the tubule analysis. After seeding ECs and culturing for 4, 8, and 12 hours, cells will be fluorescently stained with anti-CD31 and imaged for 3D tubule formation. CAM assay angiogenesis growing into a collagen scaffold. In brief, fertilized chicken embryos are incubated for 2 days before exposing the CAM. VEGFp-DS-SILY bound to a collagen gel will be placed onto the CAM. Some treatment groups will receive additional VEGF to investigate synergistic effects. Light microscope images of angiogenesis into the collagen gel coated with VEGFp-DS-SILY, taken every day from days 10 to 13, will reflect the ability of the collagen scaffold to integrate into existing vasculature and 3D angiogenic potential of VEGFp-DS-SILY with or without VEGF. We expect that VEGFp-DS-SILY treatment will increase the number of vessels formed on the CAM. Preliminary data using a Fluoraldehyde assay indicates that loading of ~300 ng VEGF per mg of nanoparticles can be achieved. We expect that using an MMP-degradable peptide diacrylate crosslinker will allow nanoparticles to degrade in protease-rich environments like the chronic wound bed and release VEGF. Adjustments to the formulation, such as crosslinker density, may need to be modified to control the rate of VEGF release. DISCUSSION/SIGNIFICANCE OF IMPACT: We expect that our angiogenic decorin mimetic will lead to a novel treatment to accelerate healing of ischemic diabetic foot ulcers, thereby reducing the need for limb amputation and mortality rate of diabetic patients. We anticipate that the diabetes research and regenerative medicine communities will (1) gain a platform for targeted delivery of growth factors, (2) understand the dependence of vascularization within 3D collagen constructs on VEGFp densities and VEGF receptor activation in controlling the degree of angiogenesis, and (3) gain the benefits of controlled angiogenesis in ischemic diabetic wound healing.

2262

The impact of alcohol dysbiosis on host defense against pneumonia

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OBJECTIVES/SPECIFIC AIMS: Alcohol consumption perturbs the normal intestinal microbial communities (alcohol dysbiosis). To begin to investigate the relationship between alcohol-mediated dysbiosis and host defense we developed an alcohol dysbiosis fecal adoptive transfer model, which allows us to isolate the host immune response to a pathogenic challenge at a distal organ (ie, the lung). This model system allowed us to determine whether the host immune responses to *Klebsiella pneumoniae* are altered by ethanol-associated dysbiosis, independent of alcohol use. We hypothesized that alcohol-induced changes in intestinal microbial communities would impair pulmonary host defenses against *K. pneumoniae*. METHODS/STUDY POPULATION: Mice were treated with a cocktail of antibiotics daily for 2 weeks. Microbiota-depleted mice were then recolonized by gavage for 3-days with intestinal microbiota from ethanol-fed or pair-fed animals. Following recolonization groups of mice were sacrificed prior to and 48 hours post respiratory infection with *K. pneumoniae*. We then assessed susceptibility to Klebsiella infection by determining colony counts for pathogen burden in the lungs. We also determined lung and intestinal immunology, intestinal permeability, as well as, liver damage and inflammation. RESULTS/ANTICIPATED RESULTS: We found

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that increased susceptibility to *K. pneumoniae* is, in part, mediated by the intestinal microbiota, as animals recolonized with an alcohol-induced dysbiotic intestinal microbial community have significantly higher lung burdens of *K. pneumoniae* (5 × 104 CFU vs. 1 × 103 CFU) independent of EtOH. We also found that increased susceptibility in alcohol-dysbiosis recolonized animals was associated with a decrease in the recruitment and/or proliferation of CD4+ and CD8+ T-cells (1.5 × 109 cells vs. 2.5 × 109 cells) in the lung following Klebsiella infection. However, there were increased numbers of T-cells in the intestinal tract following Klebsiella infection, which may suggest that T cells are being sequestered in the intestinal tract to the detriment of host defense in the lung. Interestingly, mice recolonized with an alcohol-dysbiotic microbiota had increased intestinal permeability as measured by increased levels of serum intestinal fatty acid binding protein (55 vs. 30 ng/mL). Alcohol-dysbiotic microbiota also increased liver steatosis (Oil Red-O staining) and liver inflammation (>2-fold expression of IL-17 and IL-23). DISCUSSION/SIGNIFICANCE OF IMPACT: Our findings suggest that the commensal intestinal microbiota support mucosal host defenses against infectious agents by facilitating normal immune responses to pulmonary pathogens. Our data also suggest that increased intestinal permeability coupled with increased liver inflammation may impair the recruitment/proliferation of immune cells in the respiratory tract following infection. The role of the microbiota during host defense will be important areas of future research directed at understanding the effects of microbial dysbiosis in patients with AUDs.

2275

Essential amino acid supplementation improves lipid metabolism in older adults with elevated triglycerides

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OBJECTIVES/SPECIFIC AIMS: This study will assess the effect of essential amino acid (EAA) supplementation on plasma triglyceride (TG) in elderly adults. We will also explore the mechanisms mediating EAA mediated changes in fat metabolism and to suggest promising routes to refine therapy of hypertriglyceridemia. METHODS/STUDY POPULATION: In total, 7 nondiabetic male and female subjects ages 50–75 years with elevated plasma TG levels (130–500 mg/dL) were recruited to participate in an acute (5 h) and long-term (8 wk) EAA supplementation study. We measured changes in regional and whole body fat metabolism, including changes in body composition, plasma TG levels, whole body fat metabolic rates, tissue mitochondrial respiratory capacity, and metabolomic profiles before and after supplementation. RESULTS/ANTICIPATED RESULTS: Long-term EAA supplementation decreased fasted plasma TG levels by 19% ($p < 0.01$). Metabolomics of skeletal muscle found acute EAA supplementation resulted in increased EAA metabolic products while long-term supplementation resulted in increased anaplerosis [flux into the tricarboxylic acid cycle (TCA) intermediate pool] and anaplerotic substrates [propionyl ($p < 0.01$) and succinyl ($p < 0.01$) carnitine] and intermediates of long-chain fatty acid metabolism [stearoyl ($p < 0.01$) and myristoyl ($p < 0.05$) carnitine]. However, tissue level respiratory capacity appeared to be unaffected by EAA supplementation. DISCUSSION/SIGNIFICANCE OF IMPACT: EAA supplementation has potential to improve lipid metabolism and plasma TG levels in non-diabetic older adults. Mitochondrial metabolomics suggest that insufficient TCA pool size may limit tissue fatty acid oxidation and may provide an additional route for nutritional therapy.

2290

Control of atherosclerosis regression by LXRα S198 phosphorylation

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OBJECTIVES/SPECIFIC AIMS: Accumulation of cholesterol-laden macrophages in arterial walls leads to atherosclerosis. LXRs induce expression of genes that are atheroprotective in macrophages including CCR7, a chemokine receptor that promotes their emigration from the plaque. CCR7 expression has been shown to be negatively regulated by phosphorylation of LXRα at S198 and is reduced in diabetic mice that show impaired plaque regression. I hypothesized that LXRα phosphorylation at S198 diminishes macrophage emigration from atherosclerotic plaque and contributes to impaired regression in diabetes. METHODS/STUDY POPULATION: Inducible LXRα S198A phosphorylation deficient knock in mouse were used as donors for bone marrow transplantation into mice prone to develop atherosclerosis. Plaques were developed by placing mice on western diet; and regression was induced by lowering their lipid levels. Aortic plaques were then analyzed by using morphometric, histological, and molecular analyses in control and diabetic mice expressing either LXRα WT or LXRα S198A during regression. RESULTS/ANTICIPATED RESULTS: Surprisingly, lack of phosphorylation increased plaque macrophage content and impaired regression under normoglycemic condition; however, it did not exacerbate diabetic regression. Plaques in diabetic mice were associated with increased LXRα S198 phosphorylation. Consistent with this, LXRα phosphorylation is enhanced in macrophages cultured under hyperglycemic conditions indicating glucose-dependent regulation of LXRα phosphorylation. Monocyte trafficking studies reveal that lack of phosphorylation and diabetes independently increase recruitment of monocytes in the plaque that might contribute to increased macrophage content. Importantly, I found that diabetes also increases macrophage retention in the plaque, which is reversed in the absence of phosphorylation. We predict that this increased retention results from inhibition of emigration of plaque macrophages through enhanced phosphorylation in diabetes. DISCUSSION/SIGNIFICANCE OF IMPACT: These findings suggest that inhibiting LXRα phosphorylation could be beneficial in diabetic atherosclerosis to reverse the accumulation of macrophages in the plaque. This study imparts insight on regulation of plaque macrophage trafficking through LXRα S198 phosphorylation.

2295

A novel in vivo zebrafish model of hematopoietic stem cell-driven regeneration of blood

Samima Sultana Habbsa, Mia McKinstry, Sara Payne, Christian Mosimann and Teresa Bowman

OBJECTIVES/SPECIFIC AIMS: Hematopoietic stem and progenitor cells (HSPCs) function to maintain steady state production of new blood cells and to rapidly respond to blood cell loss. Little is known regarding how HSPCs develop the ability to sense and respond to blood cell loss during embryogenesis. Gaining insight into the robust ability of HSPCs to regenerate blood during early development may allow us to develop therapies to rejuvenate this capacity at any stage. METHODS/STUDY POPULATION: We generated a new hematopoietic-specific and inducible cell ablation zebrafish model to uncover the origins of regenerative capacity in HSPCs during development. These transgenic zebrafish express a cyan fluorescent protein (CFP)-nitroreductase (NTR) fusion construct under the control of the draculin (drl) promoter (drl:CFP-NTR), which restricts NTR expression to blood cells. Co-expression analyses of drl:CFP-NTR with known markers of other blood types including HSPCs (runx1 + 23:mCherry), erythroid cells (gata1:dsRed), and lymphoid cells (rag2:RFP), revealed drl:CFP-NTR was restricted to HSPCs and erythrocytes. To delineate the regeneration potential of embryonic HSPCs, we exposed drl:CFP-NTR transgenic zebrafish embryos to Metronidazole (MTZ), which results in selective ablation of only NTR-expressing blood cells. Embryos were treated from 2 to 3 days postfertilization and recovery of drl+ and gata1+ cells was evaluated over a 7-day recovery period. RESULTS/ANTICIPATED RESULTS: Following MTZ exposure, the nadir of drl+ cell ablation occurs at 2 days post MTZ (dpM) treatment. During the renewal phase of blood regeneration, we first observe recovery of drl+ cells by about 4 dpM, while more mature blood cells like gata1+ erythrocytes show a delayed recovery at about 6 dpM. Our results suggest that HSPCs can respond to injury as early as 2 days of life and that the HSPC-driven regeneration of embryonic blood cells occurs in a hierarchical fashion, similar to regeneration of the adult blood system. DISCUSSION/SIGNIFICANCE OF IMPACT: We have established a quantitative method for in vivo real-time monitoring of embryonic and larval blood regeneration. A significant advantage of our system is that we can use these insights to guide an in-vivo drug screen for factors that accelerate HSPC-driven blood regeneration in a complex biological environment.

2300

E-prescribing research participation: Feasibility of recruiting research participants using an EMR-integrated health information technology

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OBJECTIVES/SPECIFIC AIMS: To study the rate of recruitment to the Pulmonary Research Registry (PRR) at the University of Chicago using HealtheRx recruitment Versus usual practice. METHODS/STUDY POPULATION: CommunityRx is a health information technology, integrated with electronic medical record (EMR) platforms, that generates personalized referrals ("HealtheRxs") for community-based programs and services that

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address basic and other health-related self-care needs. The target population included people ages 18 and older, English speaking, living in 1 of 16 ZIP codes on Chicago's south and west sides (106 mi^2) who received care at ≥1 of 28 CommunityRx partner sites and had a diagnosis of asthma or COPD. Between December 2015 and December 2016, information about pulmonary research participation opportunities was included on the HealtheRxs of eligible patients contemporaneously with usual registry recruitment methods. Usual methods, used since 2010 by the PRR group, included public advertisements requiring the patient to call the research team for more information and education of eligible patients identified during routine clinical care with a Pulmonary/Critical Care clinician or when enrolling in a pulmonary clinical trial. We hypothesized that, compared with usual recruitment practices, the HealtheRx recruitment strategy would increase the rate and decrease the per subject cost of patient recruitment to a prospective registry. Total annual recruitment costs for each method were calculated and divided by the number of consented PRR enrollees per method. RESULTS/ANTICIPATED RESULTS: Between December 22, 2015 and December 15, 2016 13,437 HealtheRxs (8762 for asthma, 3842 for COPD, and 833 for both asthma and COPD) were generated with the recruitment advertisement. In total, 41 patients responded to the ad and participated in the phone survey. In which 15 (36.5%) participants self-reported a diagnosis of asthma only (65% of all HealtheRxs with advertisement were for asthma only), 9 (22%) reported a diagnosis of COPD only (28.5% of all HealtheRxs with advertisement were for COPD only), and 17 (41.5%) reported diagnoses of both asthma and COPD (6.2% of all HealtheRxs with advertisement were for asthma and COPD). Most participants were female (n = 28), non-Hispanic black (n = 37), and not employed (n = 39). The median age was 57. The majority (n = 31) had never participated in health or medical research and was not aware of current opportunities to participate in research (n = 25). All 41 participants expressed interest in joining PRR and were mailed a blank PRR consent form and a prepaid return envelope with their incentive check for the telephone survey. To date, 5 participants returned a signed consent form via mail and were enrolled in PRR. During the same period, 4 patients enrolled in PRR via usual recruitment methods. The cost per subject to enroll in PRR was $364.40 using the HealtheRx recruitment and $4590 using usual practice. DISCUSSION/SIGNIFICANCE OF IMPACT: NIH has called for innovation in research recruitment methodologies to increase enrollment especially of people who are under-represented in clinical trials research. This study demonstrates the feasibility and efficiency of using an EMR-integrated recruitment method to enroll people of under-represented minority groups to a research registry.

2302

Downregulation of miR-1207-3p is correlated to upregulation of FNDC1, FN1, AR, and c-MYC in aggressive prostate cancer in men of African ancestry

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OBJECTIVES/SPECIFIC AIMS: Prostate cancer is the second most common cancer in the world for men. For reasons still unclear, aggressive PCa disproportionately affects males of African ancestry (MoAA). Incidence and mortality rates are highest in MoAA as they have consistently shown a 2.3–3.0-fold higher risk of mortality compared with Caucasian men. This aggressiveness of PCa may be due to specific biological factors. Studies have established that microRNAs (miRNAs), essential in post-transcriptional gene regulation, are dysregulated in PCa. miR-1207-3p is encoded at the PVT1 gene locus, which is located downstream of MYC on the 8q24 PCa susceptibility locus. The chromosomal region 8q24 is associated with aggressive PCa. Yet miR-1207-3p in PCa in MoAA has never been investigated. Moreover, studies have shown that PVT1/MYC co-operation is a fundamental feature in all cancers with 8q24 amplification and 98% of the 8q24 amplicons contained concurrent amplification of the MYC and PVT1 loci. Moreover, MYC has been linked to PCa aggressiveness, and has been reported to be downstream of androgen receptor (AR) in some PCa. However, the mechanisms regulating c-MYC have never been studied in MoAA. We have recently demonstrated that miR-1207-3p has prognostic value in PCa, and directly binds to the 3′ UTR of Fibronectin type III domain containing 1 (FNDC1) to regulate a novel FNDC1/fibronectin (FN1)/AR pathway upregulated in metastatic PCa. However, the relevance of this novel and clinically significant miR-1207-3p molecular pathway in PCa in MoAA is unknown. Therefore, we hypothesized that miRNA 1207-3p, encoded at the 8q24 PCa susceptibility locus, is a PCa biomarker with clinical applications in MoAA. Our specific aim was to assess the clinical relevance of miR-1207-3p, FNDC1, FN1, AR, and MYC expression in aggressive PCa in a cohort of West African Black males. METHODS/STUDY POPULATION: Consequently, we aimed to determine the expression profile of miRNA-1207-3p, FNDC1, FN1, AR, and MYC in histologically confirmed normal prostate (n = 24), benign prostate (n = 44) and malignant prostate tissue (n = 29) from prostatectomy or transrectal ultrasound-guided biopsies in patients recruited at the University College Hospital, Ibadan, Nigeria, a sub-Saharan Black African population. In total, 17 patients had tumor tissues with Gleason score ≥8. Tissues were collected in compliance with Institutional Ethics Board approved protocols. RNA extraction, cDNA synthesis, and quantitative-PCR were performed to analyze mRNA expression of miRNA-1207-3p, FNDC1, FN1, AR, and MYC. Statistical analysis were performed using SPSS software. All data were analyzed by the 1-way ANOVA test. Tukey post-hoc test was performed to determine the differences in mean expression between normal and tumor prostate tissues. $p < 0.05$ were considered significant. RESULTS/ANTICIPATED RESULTS: We discovered that miR-1207-3p is significantly underexpressed in prostate tumor tissues [0.09 ± 0.02, 95% CI (0.04, 0.136), $p = 0.000$] in comparison with normal prostate tissue in MoAA [0.92 ± 0.15, 95% CI (0.60, 1.244), $p = 0.000$]. This is the first description of miR-1207-3p differential expression in human clinical PCa in MoAA. In contrast, FNDC1 was significantly overexpressed in prostate tumor tissues [21.93 ± 8.21, 95% CI (4.97, 38.89), $p = 0.003$] in comparison with normal prostate tissues in MoAA [1.57 ± 0.45, 95% CI (0.625, 2.51), $p = 0.003$]. The same positive correlation with advanced disease held true for FN1 [tumor: 13.66 ± 3.53, 95% CI (6.38, 20.93), $p = 0.000$; normal: 1.07 ± 0.235, 95% CI (0.58, 1.56), $p = 0.000$], AR [tumor: 20.49 ± 6.74, 95% CI (6.50, 34.48), $p = 0.000$; normal: 0.94 ± 0.20, 95% CI (0.52, 1.36), $p = 0.000$], and c-MYC [tumor: 33.93 ± 8.43, 95% CI (16.53, 51.33), $p = 0.000$; normal: 1.94 ± 0.36, 95% CI (1.18, 2.70)]. The significantly increased mean expression for FNDC1, FN1, AR, and c-MYC in prostate tumor tissues in comparison with normal prostate tissues indicate that their overexpression is associated with increased risk of cancer progression in MoAA. DISCUSSION/SIGNIFICANCE OF IMPACT: These results show that the underexpression of miR-1207-3p and the overexpression of FNDC1, FN1, AR and MYC is associated with aggressive PCa in MoAA. miR-1207-3p, and it molecular target FNDC1, may be useful biomarkers for prognostication of PCa in MoAA.

2307

Resting state network profiles of Alzheimer disease and frontotemporal dementia: A preliminary examination

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OBJECTIVES/SPECIFIC AIMS: Recent evidence from resting-state fMRI studies have shown that brain network connectivity is altered in patients with neurodegenerative disorders. However, few studies have examined the complete connectivity patterns of these well-reported RSNs using a whole brain approach and how they compare between dementias. Here, we used advanced connectomic approaches to examine the connectivity of RSNs in Alzheimer disease (AD), Frontotemporal dementia (FTD), and age-matched control participants. METHODS/STUDY POPULATION: In total, 44 participants [27 controls (66.4 ± 7.6 years), 13 AD ($68.5.63 \pm 13.9$ years), 4 FTD (59.575 ± 12.2 years)] from an ongoing study at Indiana University School of Medicine were used. Resting-state fMRI data was processed using an in-house pipeline modeled after Power *et al.* (2014). Images were parcellated into 278 regions of interest (ROI) based on Shen *et al.* (2013). Connectivity between each ROI pair was described by Pearson correlation coefficient. Brain regions were grouped into 7 canonical RSNs as described by Yeo *et al.* (2015). Pearson correlation values were then averaged across pairs of ROIs in each network and averaged across individuals in each group. These values were used to determine relative expression of FC in each RSN (intranetwork) and create RSN profiles for each group. RESULTS/ANTICIPATED RESULTS: Our findings support previous literature which shows that limbic networks are disrupted in FTLD participants compared with AD and age-matched controls. In addition, interactions between different RSNs was also examined and a significant difference between controls and AD subjects was found between FP and DMN RSNs. Similarly, previous literature has reported a disruption between executive (frontoparietal) network and default mode network in AD compared with controls. DISCUSSION/SIGNIFICANCE OF IMPACT: Our approach allows us to create profiles that could help compare intranetwork FC in different neurodegenerative diseases. Future work with expanded samples will help us to draw more substantial conclusions regarding differences, if any, in the connectivity patterns between RSNs in various neurodegenerative diseases.

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2314

Orexin/hypocretin receptor 2 (HCRTR2) in alcohol dependence diagnosis and severity: An exploratory investigation in the role of HCRTR2 rs2653349 polymorphism

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OBJECTIVES/SPECIFIC AIMS: The preliminary analysis sought to retrospectively characterize the role of hypocretin receptor 2 (HCRTR2) in the development and prognosis of AD along with associated behavioral measures including smoking, self-reported drinking history, and neuroticism. Given the results in this study along with the paucity of information regarding the functional significance of rs2653349, we intend to comprehensively characterize HCRTR2 using haplotype analyses. We will then identify relationships between our haplotype analysis and IV alcohol self-administration using the Computer-Assisted Infusion System, and phenotypes identified in a sleep study. Furthermore, we aim at identifying functional loci in the hypocretin/orexin system by investigating differential allele expression in the orexin receptors in hippocampus tissue obtained from postmortem human brains. METHODS/STUDY POPULATION: This study examined 1569 European American and African American individuals between 18 and 65 years old, 922 of whom with a current diagnosis of AD. Participants were genotyped for HCRTR2 rs2653349 and ancestry was determined via a genome-wide panel of ancestry informative markers. AD was diagnosed using the Structured Clinical Interviews for DSM-IV (SCID-IV) for psychiatric disorders and recent alcohol use was assessed by 90-day Timeline Follow-back (TLFB) interviews. Smoking was assessed using the Fagerström Test for Nicotine Dependence and neuroticism was measured using the NEO Personality Inventory. RESULTS/ANTICIPATED RESULTS: In European Americans, a significant difference was found in current AD diagnosis between AX carriers and GG carriers ($z = -2.390$, $p = 0.017$). This relationship remained significant in a logistic regression model controlled for age and gender ($R^2 = 0.269$, $p = 0.015$). TLFB drinking measures were compared based on the median values to correct for the ceiling effect resulting from the assessment covering the past 90 days. Total drinks ($U = 8.280$, $p = 0.004$), number of drinking days ($U = 6.983$, $p = 0.008$), and average drinks per days ($U = 7.221$, $p = 0.007$) were all noted to significantly differ between the two allele groups among Caucasians. The associations between rs2653349 and total drinks ($R^2 = 0.115$, $p = 0.023$) and heavy drinking days ($R^2 = 0.190$, $p = 0.015$) remained significant in linear regressions controlled for age and gender. Furthermore, Caucasian AX carriers had a higher median number of drinking days relative to GG homozygotes among current AD positive subjects ($U = 6.937$, $p = 0.012$) and a lower median number of drinking days among current AD negative subjects ($U = 4.430$, $p = 0.035$). Among Caucasian AD negative subjects, there was a significantly greater frequency of smokers ($\chi^2 = 3.550$, $p = 0.046$). In African American participants, there were no significant differences in AD diagnosis and in measures of AD severity by genotype. African American males diagnosed with current AD had higher rates of smoking in the AX group ($\chi^2 = 4.969$, $p = 0.017$). No significant associations were found between rs2653349 and neuroticism in any of the cohorts analyzed in this sample. DISCUSSION/SIGNIFICANCE OF IMPACT: The results suggest that, among Caucasians, AX carriers have an increased risk to develop AD independently of their age and gender. In addition, among individuals with a diagnosis of AD, AX carriers reported a greater number of drinking days, as measured by the TLFB, suggesting that this polymorphism also exerts an effect on the severity of the disease. This effect on increased alcohol consumption was absent in Caucasian AX carriers without current AD diagnosis. In future analysis, we will explore how different genetic profiles in HCRTR2, and also HCRTR1, may alter the orexin signaling pathway and how such alterations may predispose patients to develop AD and exacerbate AD once it develops.

2321

Soluble adenylyl cyclase (sAC) regulates melanogenesis and melanocyte response to UVB

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OBJECTIVES/SPECIFIC AIMS: Our objective is to study the role of soluble adenylyl cyclase in the melanocyte regulation of pigment in response to ultraviolet radiation. Melanocytes are specialized cells that produce melanin in organelles called melanosomes, and melanin determines the pigmentation of hair and skin. cAMP is a master regulator of pigmentation and transmembrane class of adenylyl cyclases are essential for expression of important enzymes involved in melanogenesis. However, pigmentation is also controlled by melanosomal pH, which regulates melanogenesis, tyrosinase activity, and melanosome maturation. The relationship between melanosomal pH and cAMP has been elusive. Soluble adenylyl cyclase is a noncanonical source of cAMP that is not responsive to G proteins but rather functions as a pH sensor. We recently demonstrated that loss of soluble adenylyl cyclase (sAC) activity leads to increased melanosomal pH as well as increased pigmentation in cells and hair. We expanded our research to investigate the role of sAC in the intrinsic response of melanocytes to ultraviolet radiation. METHODS/STUDY POPULATION: We utilized sACfl/fl (wild type) and sACKO mouse melanocytes and compared their change in pigmentation in response to ultraviolet radiation. Melanin was used as a measure of pigmentation. We irradiated these cells at differing doses of UVB (0, 1, 2, or 3 mJ/cm^2) daily for 3 days. After UVB treatment, cells were observed and the surviving cell numbers were determined. Cells were then analyzed for melanin content using spectroscopy. RESULTS/ANTICIPATED RESULTS: We found that while both sACfl/fl and sACKO cells had increased melanin content in response to UVB, the melanin content of sACKO cells increased more compared with sACfl/fl cells ($p = 0.001$ at daily dose of 3 mJ/cm^2). In addition, sACKO cells required less UVB dose to induce a response. We also observed that sACKO cells show increased cell death compared with sACfl/fl cells. DISCUSSION/SIGNIFICANCE OF IMPACT: Although both sACfl/fl and sACKO cells can induce melanin production in response to UV, our results suggest that sACKO cells are more sensitive. We believe that this increased response in sACKO cells is due to increased melanosomal pH. In addition, sACKO cells show increased cell death, suggesting that sAC is important in the damage response secondary to UV exposure. UV plays a wide range of roles in skin biology such as contributing to cancer risk and pigmentation. Since pigmentation is essential for the protection of the skin from UV insult, further investigation of possible mechanisms in which sAC can influence pigmentation in response to UV is warranted.

2337

Doxorubicin exposure in vitro stimulates ROS production and directly suppresses cardiac fibroblast proliferation

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OBJECTIVES/SPECIFIC AIMS: Our research strives to understand the pathophysiology of doxorubicin cardiotoxicity, focusing on the understudied non-myocyte cardiac cells. Our understanding will enable researchers to develop protective or alternative therapies for cancer patients and treatments for cancer survivors. METHODS/STUDY POPULATION: Early studies have been carried out in isolated primary cardiac fibroblasts. Cells were treated with varying doses of doxorubicin. Cell viability, proliferation, and reactive oxygen species generation have all been studied. Future studies will focus on mitochondrial assessment in treated cells and confirmation of findings in animal models. Potential therapies discovered in these studies will also be conducted in animal models. RESULTS/ANTICIPATED RESULTS: Our results show a direct effect of doxorubicin on cardiac fibroblasts in vitro. Treated cells show a decreased rate of proliferation and increased production of reactive oxygen species. Similarly to cardiomyocytes, we hypothesize that reactive oxygen species damage the mitochondria of cardiac fibroblasts thereby altering their function and playing a role in doxorubicin cardiotoxicity. DISCUSSION/SIGNIFICANCE OF IMPACT: Current therapies have not been able to adequately protect patients from the cardiotoxicity of doxorubicin and other anthracyclines. A complete understanding of how doxorubicin damages cardiac tissue will only be possible by studying all cell types of the heart. With a better understanding, alternative therapies can be developed to prevent or treat doxorubicin cardiotoxicity without sacrificing the efficacy of doxorubicin in treating cancer.

2346

Receptor for advanced glycation end-products: Mitigating the persistent effects of particulate matter induced airway injury

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OBJECTIVES/SPECIFIC AIMS: Obstructive lung disease following particulate matter (PM) exposure is a major health concern. Coexisting metabolic

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syndrome (MetSyn) often occurs. Receptor for advanced glycation end products (RAGE) is highly expressed in the lung, is a strong predictor of FEV1, and is a key mediator of MetSyn. To determine if the loss of RAGE protects from the persistence of effects of particulate associated lung injury in a murine model. METHODS/STUDY POPULATION: Wild type (WT) and RAGE knockout (RKO) mice were exposed to 100 μg of PM (WTC-Aggregate, PM53) or PBS control by oropharyngeal aspiration. Lung function, methacholine challenge, and bronchoalveolar lavage (BAL) were quantified 28 days after PM exposure using flexiVent (Scireq Montreal, QC). BAL was obtained and cell differentials, cytokines and transcription factors were assayed. Bio-volume to airspace ratio and mean chord length were measured (Image J and Adobe Photoshop). RESULTS/ANTICIPATED RESULTS: WT mice were hyper-reactive to methacholine compared with their PBS controls 28 days after a single exposure to PM. They recovered from increased neutrophilia, loss of FEV, decreased compliance, and increased resistance, which were previously observed 24-hours after exposure. RKO were not hyper-reactive when compared with their own PBS controls. Lung histology shows persistence of loss of alveolar space in WT mice exposed to PM after 28 days. Area fraction was significantly higher in PM exposed WT mice after 28 days which was not significant after 24 hours. Mean chord length was significantly shorter for PM exposed at both time points for WT mice. The relative expression of phosphorylated to total CREB and ERK1/2 proteins was lower in RKO PM exposed mice compared with WT PM while STAT3 expression was lower in WT PM compared with WT PBS. PM induced a lower fold change of total proteins from the PBS controls in RKO for CREB, p38, ERK1/2, STAT3, and STAT5. JNK and p70S6k total proteins expressed a decreased fold change in WT PM exposed mice compared with WT PBS controls. DISCUSSION/SIGNIFICANCE OF IMPACT: A single dose of PM can produce persistent airway hyper-reactivity after 28 days of exposure. This PM induced injury is alleviated in the absence of RAGE, similar to what was seen at 24 hours. Inhibiting RAGE may be key to limiting the persistent inflammatory effects of high intensity PM exposure.

2350

The role of gut microbiota in the susceptibility of Parkinson disease development

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OBJECTIVES/SPECIFIC AIMS: Several clinical studies have established a correlation between changes in relative bacterial populations in the gut and Parkinson disease. However, few published experiments have been able to parse out whether these associations are causative or correlative. Our aim is to determine how bacteria in the gut may impact the health and resilience of dopaminergic signaling. Our experiment is designed to serve as a proof-of-principle that controlled alterations to the gut microbiome alters mechanisms in dopamine homeostasis in the midbrain. METHODS/STUDY POPULATION: Bacterial inoculation 8–10-week-old germ-free male mice (C57BL/6) were exclusively used in this experiment. Mice were orally gavaged every 3 days (D0, 3, 6, and 9) with 100 μL novel bacterial suspension (~108 CFU resuspended in PBS with 1.5% $NaHCO_3$) or vehicle and were sacrificed on D11. Tissue preparation—brains were quickly extracted and the striatum was isolated and homogenized in either RIPA buffer with protease inhibitors (for Western blot analysis) or in 0.1 N $HClO_4$ (for HPLC processing). The homogenates were processed through fractional centrifugation to remove cellular debris. Lysate samples were frozen at −80°C until ready for analysis. Protein expression quantification—expression of proteins were measured using intensity of bands from Western blots. Lysates were denatured prior to loading with LB with 10% β-mercaptoethanol and 30-minute incubation at 37°C. All immunoblots were normalized to immunoreactivity to α-tubulin. Immunoblot intensity was determined using the ImageJ software. Dopamine/dopamine metabolite quantification HPLC analysis was used to determine dopamine and dopamine metabolite concentration. Aliquots of the lysate were injected onto a C18 column using a mobile phase consisting of 50 mM $H_2NaO_4P{\cdot}H_2O$, 0.72 mM sodium octyl sulfate, 75 μM Na_2 EDTA, and 10% acetonitrile (pH 3.0). The mobile phase was pumped through the system at 0.3 mL/minute. RESULTS/ANTICIPATED RESULTS: Measured total dopamine concentration through HPLC analysis in the striatum showed no significant differences in the bacteria-treated group relative to the control group. The metabolites DOPAC and HVA had an elevated measured concentration in the bacteria-treated group relative to the control group. Western blot analysis showed decreased immunoreactivity for DAT and TH in the bacteria-treated group compared with the control group. There was no significance difference in the immunoreactivity for VMAT2. DISCUSSION/SIGNIFICANCE OF IMPACT: This study demonstrates that dopamine signaling dynamics in the midbrain can be altered by changes in the gut flora in mice. These results further substantiate the impact of the gut-brain axis and may even point to a potential avenue of bolstering the resilience of dopaminergic neurons in preventing the onset of PD. Further experiments must be performed to understand the mechanism of the observed changes and to determine if these changes have any salutary effect.

2357

Impacts of a long-term community-university partnership on investigator-initiated research at an Urban Research University

Emily Zimmerman, Chanel Bea, Alicia Aroche and Alex Krist

OBJECTIVES/SPECIFIC AIMS: Engaging Richmond is a community-university partnership, made up of local residents and university faculty and staff that was established in 2011 with an NIH supplement to a Clinical and Translational Science Research Award at Virginia Commonwealth University (VCU). The primary aims of the supplement were to (1) to conduct community-based participatory research (CBPR) on the leading causes of health disparities perceived by the Richmond community and (2) to thereby highlight community needs and assets and build capacity for future community-engaged research (CEnR). The goal was to prepare a community-focused, community-prioritized, health equity report while building capacity, strengthening relationships, and discovering local barriers to CEnR, and therefore to stimulate, facilitate, and inform future CEnR at VCU. METHODS/STUDY POPULATION: This is a case study exploring the impact of 1 community-university partnership on investigator-initiated research using historical and qualitative data. RESULTS/ANTICIPATED RESULTS: Although Engaging Richmond received only 12 months of support from the NIH supplement that provided its initial funding, the community-university partnership has worked continuously since its formation in 2011. This work has not only helped to build connections with the community and key stakeholders, it has also contributed substantially to the resources available to university faculty pursuing CEnR. Specifically, we find that Engaging Richmond has contributed to investigator initiated research in the following ways, either working as co-investigators or in a consultative capacity: consultation on proposal development (5 projects); assisted with instrument development (4 projects); participant recruitment (7 projects); data collection and analysis (6 projects); dissemination (5 projects). In addition to collaboration on projects, Engaging Richmond has increased institutional capacity for CEnR through its contributions to the Annual Community Engaged Institute at the university and the Center of Clinical and Translational Science's Community Review Board (CRB). The CRB helps researchers work successfully in a community setting, enhance the research design, help to improve study implementation and assist with translation and dissemination of findings. DISCUSSION/SIGNIFICANCE OF IMPACT: Although community-university partnerships have become much more common over the past several decades, there remains a gap in research evidence on the impact of these partnerships. In their 2004 review, Viswanathan *et al.* note that community-based participatory research studies infrequently document improved capacity of researchers and research organizations as an outcome, despite the expectation that such improvement will accrue through investment in CEnR. A more recent study assessing the range of community-university partnerships across a research university also noted the lack of processes in place to assess impacts (Holton *et al.*, 2015). While assessments of CEnR impact on communities have become increasingly common as demand for evidence about the effectiveness of community-engaged partnerships has mounted, there does not appear to be a similar trend in assessing the impact of these efforts on faculty research and institutional capacity. By focusing on the impact of 1 community-university partnership that has been sustained for over 5 years, we highlight the ways in which having ongoing partnerships in place can support and strengthen investigator-initiated research, reflecting the flexible, "2-way approach" (Weerts and Sandmann, 2010) at the heart of CEnR.

2373

Effects of cortical stimulation of the noninfarcted Versus peri-infarcted motor cortex

Serena-Kaye Kinley-Cooper and DeAnna Adkins

OBJECTIVES/SPECIFIC AIMS: The objectives of this study are to determine whether high-frequency ipsi-lesion or low-frequency contra-lesion ECS improves forelimb function following experimental stroke in aged animals with focal and large strokes. We also want to investigate whether ECS-induced improvements in motor function are related to an enhancement of neural structural plasticity (dendrites and synapses) and changes in growth promoting (BDNF) and growth inhibiting (NOGO-A) expression in the infarcted motor cortex in young and aged animals. METHODS/STUDY POPULATION: We will

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investigate whether excitatory ECS of the infarcted cortex or inhibition of the noninfarcted cortex combined with daily impaired-forelimb rehabilitative training (RT) results in greater motor functional recovery compared to RT alone. Immunohistochemical (IHC) analyses and unbiased stereological techniques will be performed to investigate changes in proteins associated with dendritic restructuring (MAP2), synaptic plasticity (PSD95 and synaptophysin), and alteration in the expression of BDNF and NOGO-A. RESULTS/ANTICIPATED RESULTS: We expect that inhibitory ECS of the noninfarcted motor cortex will improve behavioral outcomes in moderate to severe stroke animals compared with excitatory ECS or no stimulation (RT alone) animals. We predict that the ECS condition that improves motor performance most significantly compared with RT alone will have a corresponding greater increase in remaining ipsi-infarct motor cortical dendritic and synaptic plasticity (demonstrated by a greater density of MAP2, synaptophysin, and PSD-95 immunoreactivity), and greater expression of BDNF. It is unknown, but also expected that better behavioral recovery will coincide with a greater reduction in NOGO-A in the injured motor cortex. DISCUSSION/SIGNIFICANCE OF IMPACT: These studies will aid in creating a model that will allow for a better understanding of the relationship between brain stimulation, severity of injury and, in future studies, aging. These studies will also help clarify previous conflicting brain stimulation results.

2395

Self-assembling cartilage from equine mesenchymal stem cells: A comparison of bone marrow and cord blood-derived MSCs

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OBJECTIVES/SPECIFIC AIMS: Joint injury is a common cause of premature retirement for many equine athletes. Implantation of engineered cartilage offers the potential to increase the success rate of surgical intervention and hasten recovery times. Mesenchymal stem cells (MSCs) offer a particularly attractive cell source for cartilage engineering. Although bone marrow-derived MSCs (BM-MSCs) have been most extensively characterized for musculoskeletal tissue engineering, studies suggest cord blood MSCs (CB-MSCs) may elicit a more robust chondrogenic phenotype. The objective of this study was to determine superior equine MSC source for cartilage engineering via a self-assembling process (SAP). METHODS/STUDY POPULATION: MSCs derived from bone marrow or cord blood were stimulated to undergo chondrogenesis via 3D culture and then used to generate cartilage via SAP. The resulting neocartilage produced from either BM-MSCs or CB-MSCs was compared by measuring biochemical, mechanical, and histological properties. RESULTS/ANTICIPATED RESULTS: We found that while BM-MSCs possessed higher tensile properties and collagen content, CB-MSCs had superior compressive properties and GAG content. Moreover, CB-MSCs had lower alkaline phosphatase activity and higher collagen type II, suggesting a more hyaline cartilage-like phenotype. DISCUSSION/SIGNIFICANCE OF IMPACT: In conclusion, while both BM-MSCs and CB-MSCs were able to form neocartilage, CB-MSCs resulted in tissue more closely resembling native equine articular cartilage, and is therefore the superior MSC source for purposes of cartilage self-assembly.

2420

Loss of eptB decreases systemic inflammation during *Salmonella* infection and allows for evasion of the host immune response

Lillian F. Zhang, Fabian Rivera-Chavez, Hirotaka Hiyoshi and Andreas J. Baumler

OBJECTIVES/SPECIFIC AIMS: Our long-term goal is to elucidate the molecular mechanisms and virulence factors that control the differential presentation of infection with Salmonella typhimurium and Salmonella typhi. The objectives of this study are to study the mechanisms that enable S. typhi to trigger a decreased inflammatory response in comparison with S. typhimurium and evade detection by the immune system, leading to the development of asymptomatic chronic carriage of S. typhi. METHODS/STUDY POPULATION: A loss of function eptB mutant S. typhimurium strain was generated. Lipopolysaccharide (LPS) was isolated from wild-type and eptB mutant S. typhimurium and wild-type S. typhi. Binding of LPS to recombinant intelectin was tested by dot blot and enzyme-linked immunosorbant assay (ELISA). C57BL/6 mice were infected with wild-type or eptB mutant S. typhimurium by oral gavage and inflammatory cytokines in the spleen, liver, and Peyer's patches were measured by qPCR. RESULTS/ANTICIPATED RESULTS: LPS isolated from wild-type S. typhimurium is not bound by intelectin, a protein that has been proposed to function in innate immunity and that is known to be able to bind certain moieties within LPS. Conversely, LPS isolated from eptB mutant S. typhimurium and wild-type S. typhi, which lacks a functional eptB, is bound by intelectin. Mice infected with an eptB mutant S. typhimurium exhibit decreased expression of inflammatory cytokines in the spleen compared to mice infected with the wild type S. typhimurium, suggesting that loss of eptB function allows a nontyphoidal Salmonella serovar to mimic the stealth phenotype of typhoidal serovars. Together, these results suggest that loss of eptB function allows intelectin to bind to and detoxify Salmonella LPS, leading to decreased systemic inflammation during infection. DISCUSSION/SIGNIFICANCE OF IMPACT: These results have broad implications for how pathogens such as S. typhimurium induce systemic shock during infection and may also help to explain a mechanism for how S. typhi is able to evade immune detection and enhance dissemination to systemic sites, leading to development of the asymptomatic chronic carrier state. Further investigation of this novel virulence mechanism will mark a decisive step forward in understanding the mechanisms underlying the differential pathogenesis of S. typhimurium-induced gastroenteritis and S. typhi-induced typhoid fever. Additionally, these results contribute to our understanding of the interactions between host and pathogen in affecting disease presentation, which will have wide appeal among researchers interested in microbial pathogenesis and the contribution of host-pathogen interactions to health and disease.

2422

Magnetic nanoparticles facilitate tracking of dendritic cells for treatment of malignant brain tumors

Adam Grippin, Elias Sayour, Jon Dobson and Duane A. Mitchell

OBJECTIVES/SPECIFIC AIMS: Immune-based therapies hold great promise for treatment of refractory tumors. However, development is limited by a lack of identified immune correlates to vaccination. We recently showed that dendritic cells (DCs) prolong progression-free survival (PFS) and overall survival (OS) in patients with glioblastoma, and that DC migration to site draining lymph nodes robustly correlates with both PFS and OS. While this appears to be a reliable immune correlate, the complexity of routine labeling for PET and SPECT prohibits validation in a large clinical study. We therefore seek to develop a safe, translatable reporter that can be imaged with a widely available imaging modality. METHODS/STUDY POPULATION: The cationic liposome 1,2-doleoyl-3-trimethylammonium-propane (DOTAP) was loaded with MRI-imageable iron oxide nanoparticles (IONPs) with or without the neutral molecules PEG and cholesterol. The resulting nanoparticles were loaded with RNA to form RNA-NPs that were characterized with transmission electron microscopy (TEM) and used to transfect DCs in vitro; 4.7 T MRI was then used to image particles or cells in agarose gel phantoms. RESULTS/ANTICIPATED RESULTS: TEM images of RNA-NPs indicate the presence of IONP-loaded liposomes. In vitro transfection experiments demonstrate that iron oxide does not reduce RNA-NP-mediated transfection of DCs. Additionally, small amounts of either PEG or cholesterol within RNA-NPs increased transfection of DC2.4s and enhanced T-cell priming by bone marrow-derived dendritic cells. A series of 4.7 T MRI images of particles in cells, spleens, and LNs demonstrated quantifiable differences in particle density between groups. DISCUSSION/SIGNIFICANCE OF IMPACT: This data suggests that IONP-loaded RNA-NPs can be imaged with MRI and manipulated to augment DC function. Future work will include in vivo imaging in mice and safety studies to facilitate translation into first-in-human studies. Successful completion of this project would provide a powerful clinical tool to improve and track patient responses to immune therapy.

2427

Metabo-therapy for RARRES1-depleted epithelial cells using repurposed mitochondrial metabolism inhibitor, metformin

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OBJECTIVES/SPECIFIC AIMS: The goal of this study is to examine bioenergetic phenotype of retinoic acid receptor responder 1 (RARRES1)-depleted epithelial cells and to facilitate the discovery of personalized metabo-therapeutics in the context of cancers characterized with loss of or low expression of RARRES1. METHODS/STUDY POPULATION: Anoikis assay and annexinV labeling were used to assess drug resistance and apoptotic phenotype in RARRES1-depleted epithelial cells. Metabolomics, AMP kinase activity, mito-tracker, and extracellular flux assays were used to examine the bioenergetic profile of

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RARRES1-depleted epithelial cells. Extracellular flux assays were used to assess the phenotype of RARRES1-depleted epithelial cells treated with or without metformin. RESULTS/ANTICIPATED RESULTS: RARRES1 is a major regulator of mitochondrial function. Its depletion in tumors induces an oxidative phosphorylation dependent phenotype and subsequently increases ATP abundance in the cell, enhances anabolic pathways and increases survival. Treatment with FDA approved mitochondrial respiration inhibitor, metformin, reversed the metabolic phenotype of RARRES1 depleted-epithelial cells. Metformin could be the ideal therapeutics to reduce tumor burden in cancers with loss of or low expression of RARRES1. DISCUSSION/SIGNIFICANCE OF IMPACT: Bioenergetic dynamics are emerging as a basis for understanding the pathology of cancer. The malignancy progresses as its metabolic pattern and mitochondrial respiration become more dysfunctional. The regulatory pathways of bioenergetic dynamics are currently poorly understood, and the characterization of proteins implicated in those processes must be assessed. One understudied protein and tumor suppressor is RARRES1. RARRES1 is induced by retinoic acid (a major metabolic regulator) and functions as a putative carboxypeptidase inhibitor. Understanding the connection between this carboxypeptidase inhibitor and intermediary metabolism will enlighten our understanding of the bioenergetic profile of cells and facilitate the discovery of personalized metabo-therapeutics in the context of cancer.

2436

Disagreement in middle ear volume values between tympanometry and 3-dimensional volume reconstruction

David Carpenter, Debara L. Tucci, David M. Kaylie and Dennis O. Frank-Ito

OBJECTIVES/SPECIFIC AIMS: Middle ear volume (MEV) is a clinically relevant parameter in the treatment of many common conditions including otitis media, tinnitus, and conductive hearing loss. A growing number of studies have shifted from using tympanometry to 3-dimensional volume reconstruction (3DVR) to calculate MEV; however, MEV values between these methodologies have never before been directly compared. Here, our objective is to characterize agreement between MEV measurement methods across disease states and middle ear sizes. METHODS/STUDY POPULATION: Middle ears were identified from 36 patients ranging 18–89 years of age who underwent tympanometry testing during preoperative workup for tympanic membrane (TM) perforation, up to 1 month prior to a standard-of-care temporal bone computed tomography (CT) between October 15, 2005 and October 15, 2015. MEV values calculated by both tympanometry and 3DVR were analyzed for agreement using Bland and Altman plots. A correction factor was calculated where ear canal volumes were available for contralateral middle ears without TM perforation (n = 12), and was applied to a second Bland and Altman plot in the corresponding patient subgroup. MEV agreement was characterized across MEV quartiles (1 = smallest; 4 = largest) and across increasing states of middle ear disease using Kruskal-Wallis and Wilcoxon testing with Bonferonni correction. RESULTS/ANTICIPATED RESULTS: A Bland Altman plot demonstrated significant disagreement of MEV differences as compared to a priori clinical thresholds. Absolute MEV difference was significantly greater in the average MEV fourth to first quartile ($p = 0.0024$), fourth to second quartile ($p = 0.0024$), third to first quartile ($p = 0.0048$), and third to second quartile ($p = 0.048$). Absolute MEV difference was not significantly different across varying states of middle ear disease ($p = 0.44$). DISCUSSION/SIGNIFICANCE OF IMPACT: Statistically evident and clinically significant disagreement was demonstrated across tympanometric and 3DVR MEV estimates. This lack of agreement was most pronounced at higher average MEV and was persistent yet not appreciably different across varying severities of middle ear disease. These findings may limit the generalizability of studies of the middle ear that differ in MEV estimation methodology, particularly in pathophysiological states where MEV is increased.

2504

Defining peripheral B cell tolerance in pemphigus vulgaris

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OBJECTIVES/SPECIFIC AIMS: Pemphigus vulgaris (PV) is a potentially fatal blistering disease caused by autoantibodies to the keratinocyte adhesion protein desmoglein 3. Several other autoimmune diseases have defective B cell tolerance checkpoints, resulting in the accumulation of self-reactive and polyreactive B cells. METHODS/STUDY POPULATION: The present work aims to determine whether PV patients develop normal tolerance to self-antigens other than desmoglein 3, as a potential "first hit" in the development of autoimmunity. We use FACS to isolate single B cells at 4 developmental stages from 8 PV patients. We perform single-cell RT-PCR to amplify each B cell receptor, produce monoclonal antibodies, and screen these for autoreactivity using ELISA/IF to several self-antigens. At each B cell stage, we compare the frequencies of self-reactive and polyreactive B cells to those found in healthy controls. RESULTS/ANTICIPATED RESULTS: We anticipate similar frequencies between PV patients and controls, suggesting that the B cell repertoire in PV patients develops normally at early checkpoints. DISCUSSION/SIGNIFICANCE OF IMPACT: The absence of generalized reactivity would distinguish PV from other autoimmune diseases and would show that PV arises from a specific break in tolerance to a single self-antigen (desmoglein 3) during late B cell maturation. Such a result would further support PV as an ideal candidate for targeted immunotherapy.

2508

The role of platelet factor-4 (PF4 or CXCL4) in B cell differentiation

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OBJECTIVES/SPECIFIC AIMS: To investigate the role of platelet factor-4 (PF4) in B cell differentiation and develop strategies to better modulate B cell differentiation in vitro and in vivo. METHODS/STUDY POPULATION: We use tissue culture and flow cytometry to examine the role of PF4 in B cell differentiation. We use wild type (WT) and $PF4^{-/-}$ mice on a C57Bl6/J background. $PF4^{-/-}$ mice have reduced in vivo B cell differentiation responses. RESULTS/ANTICIPATED RESULTS: We anticipate that our studies will demonstrate that PF4 promotes B cell differentiation in the bone marrow microenvironment. DISCUSSION/SIGNIFICANCE OF IMPACT: The significance of this project may be valuable in developing efficient methods and strategies to increase or limit B cell numbers in vitro and in human disease.

2509

Estimation of HIV viral load using quantitative measurement of HIV-p24 on lateral flow immunoassays

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OBJECTIVES/SPECIFIC AIMS: High-sensitivity diagnostics for early infant diagnosis (EID) of HIV at the point of care (POC) are not widely available. Lateral flow immunoassays (LFA) can detect HIV-p24, but are not sensitive enough in practice. With improvements, LFA are a compelling platform for POC in EID. We used functionalized magnetic beads and immunocomplex dissociation to improve sensitivity of HIV-p24 LFA. Here, we evaluate the utility for LFA to quantitatively report HIV-p24 concentration and estimate HIV viral load. Using purified p24 protein and virion constructs, we determined the limits of detection for HIV-p24 using LFA rapid tests. Using measurements from HIV-p24 ELISA, laboratory-developed RT-qPCR, droplet digital PCR, and gold standard clinical viral load, we further characterized the relationship between HIV-p24 concentration, HIV genomic RNA, and LFA test line signal. METHODS/STUDY POPULATION: We measured HIV-p24 concentration by ELISA (R&D Systems) and LFA (Alere Determine HIV-1/2 Ab/Ag Combo). An LFA reader instrument was used to image test lines and measure test line signal on the LFA. HIV viral loads were measured using RT-qPCR and droplet digital RT-PCR protocols adapted in our lab. We obtained gold standard viral load measurements using the Roche Cobas TaqMan system at Vanderbilt University Medical Center. Data analysis was performed using Prism 7 and Stata 14. RESULTS/ANTICIPATED RESULTS: LFA test line signal increases in a predictable, dose-dependent manner and correlates with concentration of purified HIV-p24 with a linear range between 50 and 1000 pg/mL (Spearman $r = 1$; $p = 0.0004$). We compared p24 concentration (ELISA). We evaluated the utility of LFA to quantify HIV-p24 from virions suspended in human plasma, which increased the limit of detection for HIV-p24 to 100 pg/mL and shifted the linear range 100–10,000 pg/mL (Spearman $r = 0.77$; $p < 0.001$). To evaluate the relationship between HIV-p24 concentration and concentration of HIV RNA, we employed 3 molecular techniques. The LFA is capable of detecting HIV-p24 concentrations that correspond to a range of viral loads between 653,000 and

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1655 copies of viral RNA/mL. DISCUSSION/SIGNIFICANCE OF IMPACT: Our preliminary results are very promising, indicating that commercially available LFA can quantitatively measure HIV-p24 concentration to low levels. When coupled with our analysis of the relationship between HIV-p24 concentration and HIV RNA concentration, LFA may be a potential platform allowing us to estimate HIV viral burden at clinically relevant levels. Our next steps will be to evaluate this relationship in primary, clinical specimens in collaboration with the Tennessee Center for AIDS Research. We will incorporate technologies to improve the sensitivity of these LFA and evaluate their performance in field settings in Zambia. Our findings are broadly applicable for use in HIV care and treatment programs and early infant diagnosis programs around the world.

2536

The effect of skeletal muscle lipoprotein lipase overexpression on energy expenditure during weight loss maintenance and weight regain

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OBJECTIVES/SPECIFIC AIMS: Obesity is a rapidly growing epidemic and long-term interventions aimed to reduce body weight are largely unsuccessful due to an increased drive to eat and a reduced metabolic rate established during weight loss. Previously, our lab demonstrated that exercise has beneficial effects on weight loss maintenance by increasing total energy expenditure above and beyond the cost of an exercise bout and reducing the drive to eat when allowed to eat ad libitum (relapse). We hypothesized that exercise's ability to counter these obesogenic-impetuses are mediated via improvements in skeletal muscle oxidative capacity, and tested this using a mouse model with augmented oxidative capacity in skeletal muscle. METHODS/STUDY POPULATION: We recapitulated the exercise-induced improvements in oxidative capacity using FVB mice that overexpress lipoprotein lipase in skeletal muscle (mLPL). mLPL and wild type (WT) mice were put through a weight-loss-weight-regain paradigm consisting of a high fat diet challenge for 13 weeks, with a subsequent 1-week calorie-restricted medium fat diet to induce a ~15% weight loss. This newly established weight was maintained for 2 weeks and followed with a 24-hour relapse. Metabolic phenotype was characterized by indirect calorimetry during each phase. At the conclusion of the relapse day, mice were sacrificed and tissues were harvested for molecular analysis. RESULTS/ANTICIPATED RESULTS: During weight loss maintenance, mLPL mice had a higher metabolic rate ($p = 0.0256$) that was predominantly evident in the dark cycle ($p = 0.0015$). Furthermore, this increased metabolic rate was not due to differences in activity ($p = 0.2877$) or resting metabolic rate ($p = 0.4881$). During relapse, mLPL mice ingested less calories and were protected from rapid weight regain ($p = 0.0235$), despite WT mice exhibiting higher metabolic rates during the light cycle ($p = 0.0421$). DISCUSSION/SIGNIFICANCE OF IMPACT: These results highlight the importance of muscular oxidative capacity in preventing a depression in total energy expenditure during weight loss maintenance, and in curbing overfeeding and weight regain during a relapse. Moreover, our data suggest that the thermic effect of food is responsible for the differences in metabolic rate, because no differences were found in activity or resting metabolic rate. Additional studies are warranted to determine the molecular mechanisms driving the ability of oxidative capacity to assist with weight loss maintenance.

BIOMEDICAL INFORMATICS/HEALTH INFORMATICS

2048

Two EMR query strategies to assess prevalence of adrenal incidentaloma

Michio Taya, Viktoriya Paroder, Linda Haramati and Eran Bellin

OBJECTIVES/SPECIFIC AIMS: To compare methods of ascertaining prevalence for adrenal incidentalomas METHODS/STUDY POPULATION: Retrospective electronic medical record study using Looking Glass Clinical Analytics (Streamline Health, Atlanta, GA, USA) at an urban university medical center. All patients with CT or MR imaging of the abdomen between 1997 and 2014 were identified. Patients with a documented diagnosis (ICD-9 code or problem list) for any history of adrenal disease were excluded. The prevalence of adrenal incidentalomas was ascertained by 2 different detection strategies: (1) documented diagnosis of adrenal incidentaloma or (2) imaging reports containing in the same sentence "adrenal" and "nodule*," "adenoma*," or "mass*," and not containing "no" and "adrenal" in the same sentence. Adrenal pathology surprise was further established in the second approach by excluding patients having previously undergone adrenal lab testing (cortisol, aldosterone, catecholamines, adrenocorticotropic hormone, renin) or having been registered in the cancer registry for any cancer excluding superficial skin cancers. RESULTS/ANTICIPATED RESULTS: In total, 194,624 individuals were identified in our initial search, from which 1056 were excluded for past adrenal disease (Table 1). Detection by the documented diagnosis method yielded 1578 cases (0.8%), compared with 13,697 cases (7.1%) by the imaging report method (Figure 1). Further restricting detection to true "Adrenal Surprise" by excluding those with any past adrenal lab testing and cancer history yielded 10,568 cases (6.1%). Validation studies for the 7.1% prevalence with 100 records revealed an adrenal incidentaloma positive predictive value (PPV) of 98%. When restricted to size ≥1 cm the PPV was 84%. DISCUSSION/SIGNIFICANCE OF IMPACT: Comparing our first strategy using documented diagnoses as criterion for incidentaloma as used in a recent paper by Lopez D (*Annals of Internal Medicine* 2016; 165: 533–542), we found a prevalence of 0.8% in our population similar to her 0.6%. However, when searching at the level of radiology report text, we found a prevalence ten-fold greater at 7.1%. Therefore, adrenal incidentalomas are more robustly identified by searching radiologic reports.

2085

MyResearchHome@Duke—launch and adoption of a portal for the research community

Rebecca Namenek Brouwer, Rebbecca Moen, Iain Sanderson, Ebony Boulware, Johanna O'Dell and Kellie Morris Browning

OBJECTIVES/SPECIFIC AIMS: Describe (1) the features of the first release of Duke's myRESEARCHhome portal for researchers, and 2) the methods and results of adoption strategies METHODS/STUDY POPULATION: Through methods described previously (cite ACTS poster, 2016), the myRESEARCHhome portal team conducted a needs assessment to determine priorities for inclusion in the tool. Based on results of that assessment, the "minimal viable product" launched in June 2016 included the following features, organized into 9 distinct widgets: Access to all web-based research applications; ability to find and request research services; at-a-glance view of financial, protocol, and salary distribution information; access to financial and personnel reports; access to status of agreements and patents; access to CTSA-supported navigation services; visibility into required training and expiration dates; listing of announcements relevant to researchers; customized links area; ability to customize portal. The portal was developed using Ruby on Rails™, with a REACT grid framework. The development team, internal to Duke University, followed industry-standard best practices for development. After the initial release, the team employed several strategies to ensure awareness and adoption. Although written communications were an important factor for awareness, the presentations and hands-on studios proved most important. RESULTS/ANTICIPATED RESULTS: Use of the portal was directly related to in-person outreach efforts. There were small spikes after written communications, but strategies such as presentations, hands-on demonstrations, training sessions, and faculty meetings garnered the steadiest adoption rates. As of early January, 2017, almost 3000 users have interacted with the portal, with numbers rising steadily. There are an estimated 10,000 + faculty, staff, and trainees engaged in research at Duke. DISCUSSION/SIGNIFICANCE OF IMPACT: To maintain high adoption rates with the research community, engagement strategies must be ongoing. In addition to frequent in-person demonstrations, updates via written communications, and attendance at events, the portal team will employ a key adopt strategy—engaging the researchers in ongoing needs assessments. By maintaining the portal's relevance to the needs of the research community, the tool can better improve the efficiency of research at a large academic medical center.

2101

Addressing African American glaucoma through genetics and electronic health records

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OBJECTIVES/SPECIFIC AIMS: The overall goal of this project is to understand the genetic and clinical differences in POAG that specifically increase risk in

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individuals of African genetic ancestry. We will approach this goal by completing the following objectives: (i) localize a genetic signal that accounts for the significantly increased risk for primary open-angle glaucoma in African Americans and (ii) utilize electronic health records (EHR) data to expand our understanding of risk to incorporate endophenotypes of glaucoma and other clinically recorded variables that may influence disease risk. METHODS/STUDY POPULATION: We will genotype at least 200 available African American samples with glaucoma on the Illumina Infinium® Expanded Multi-Ethnic Genotyping Array (MEGAEX) and perform admixture mapping. We will then access EHR data to expand our analysis beyond glaucoma to encompass other relevant risk modifiers captured in the clinical record. RESULTS/ANTICIPATED RESULTS: We anticipate localizing a genetic signal or signals that may account for the increased POAG risk in African Americans. Our calculations indicate that we have ~81% power to detect association at a LOD score of 2 and a risk ratio of 2. Thus, we are well-powered to detect a true signal at this modest level of association DISCUSSION/SIGNIFICANCE OF IMPACT: This project will not only help to achieve precision medicine by filling in the gaps in knowledge regarding glaucoma in African Americans, but it will also address health disparities and aid in the realization of the full potential of "big data" so that all of these elements can be incorporated into a better understanding of health disparities.

2140

Estimating microscopic structures of glomeruli in renal pathology

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OBJECTIVES/SPECIFIC AIMS: (i) Digitally quantify pathologically relevant glomerular microcompartmental structures in murine renal tissue histopathology images. (ii) Digitally model disease trajectory in a mouse model of diabetic nephropathy (DN). METHODS/STUDY POPULATION: We have developed a computational pipeline for glomerular structural compartmentalization based on Gabor filtering and multiresolution community detection (MCD). The MCD method employs improved, efficient optimization of a Potts model Hamiltonian, adopted from theoretical physics, modeling interacting electron spins. The method is parameter-free and capable of simultaneously selecting relevant structure at all biologically relevant scales. It can segment glomerular compartments from a large image containing hundreds of glomeruli in seconds for quantification—which is not possible manually. We will analyze the performance of our computational pipeline in healthy and streptozotocin induced DN mice using renal tissue images, and model the structural distributions of automatically quantified glomerular features as a function of DN progression. The performance of this structural-disease model will be compared with existing visual quantification methods used by pathologists in the clinic. RESULTS/ANTICIPATED RESULTS: Computational modeling will reveal digital biomarkers for early proteinuria in DN, able to predict disease trajectory with greater precision and accuracy than manual inspection alone. DISCUSSION/SIGNIFICANCE OF IMPACT: Automated detection of microscopic structural changes in renal tissue will eventually lead to objective, standardized diagnosis, reflecting cost savings for DN through discovery of digital biomarkers hidden within numerical structural distributions. This computational study will pave the path for the creation of new digital tools which provide clinicians invaluable quantitative information about expected patient disease trajectory, enabling earlier clinical predictions and development of early therapeutic interventions for kidney diseases.

2166

Semantic characterization of clinical trial descriptions from ClincalTrials.gov and patient notes from MIMIC-III

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OBJECTIVES/SPECIFIC AIMS: This poster presents a detailed characterization of the distribution of semantic concepts used in the text describing eligibility criteria of clinical trials reported to ClincalTrials.gov and patient notes from MIMIC-III. The final goal of this study is to find a minimal set of semantic concepts that can describe clinical trials and patients for efficient computational matching of clinical trial descriptions to potential participants at large scale. METHODS/STUDY POPULATION: We downloaded the free text describing the eligibility criteria of all clinical trials reported to ClinicalTrials.gov as of July 28, 2015, ~195,000 trials and ~2,000,000 clinical notes from MIMIC-III. Using MetaMap 2014 we extracted UMLS concepts (CUIs) from the collected text. We calculated the frequency of presence of the semantic concepts in the texts describing the clinical trials eligibility criteria and patient notes. RESULTS/ANTICIPATED RESULTS: The results show a classical power distribution, $Y=2^{10}\ X^{(-2.043)}$, $R^2=0.9599$, for clinical trial eligibility criteria and $Y=5^{13}\ X^{(-2.684)}$, $R^2=0.9477$ for MIMIC patient notes, where Y represents the number of documents in which a concept appears and X is the cardinal order the concept ordered from more to less frequent. From this distribution, it is possible to realize that from the over, 100,000 concepts in UMLS, there are only ~60,000 and 50,000 concepts that appear in less than 10 clinical trial eligibility descriptions and MIMIC-III patient clinical notes, respectively. This indicates that it would be possible to describe clinical trials and patient notes with a relatively small number of concepts, making the search space for matching patients to clinical trials a relatively small sub-space of the overall UMLS search space. DISCUSSION/SIGNIFICANCE OF IMPACT: Our results showing that the concepts used to describe clinical trial eligibility criteria and patient clinical notes follow a power distribution can lead to tractable computational approaches to automatically match patients to clinical trials at large scale by considerably reducing the search space. While automatic patient matching is not the panacea for improving clinical trial recruitment, better low cost computational preselection processes can allow the limited human resources assigned to patient recruitment to be redirected to the most promising targets for recruitment.

2182

Developing a corpus for natural language processing to identify bleeding complications among intensive care unit patients

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OBJECTIVES/SPECIFIC AIMS: An accurate method to identify bleeding in large populations does not exist. Our goal was to explore bleeding representation in clinical text in order to develop a natural language processing (NLP) approach to automatically identify bleeding events from clinical notes. METHODS/STUDY POPULATION: We used publicly available notes for ICU patients at high risk of bleeding (n = 98,586 notes). Two physicians reviewed randomly selected notes and annotated all direct references to bleeding as "bleeding present" (BP) or "bleeding absent" (BA). Annotations were made at the mention level (if 1 specific sentence/phrase indicated BP or BA) and note level (if overall note indicated BP or BA). A third physician adjudicated discordant annotations. RESULTS/ANTICIPATED RESULTS: In 120 randomly selected notes, bleeding was mentioned 406 times with 76 distinct words. Inter-annotator agreement was 89% by the last batch of 30 notes. In total, 10 terms accounted for 65% of all bleeding mentions. We aggregated these results into 16 common stems (eg, "hemorr" for hemorrhagic and hemorrhage), which accounted for 90% of all 406 mentions. Of all 120 notes, 60% were classified as BP. The median number of stems was 5 (IQR 2, 9) in BP Versus 0 (IQR 0, 1) in BA notes. Zero bleeding mentions in a note was associated with BA (OR 28, 95% CI 6.5, 127). With 40 true negatives and 2 false negatives, the negative predictive value (NPV) of zero bleeding mentions was 95%. DISCUSSION/SIGNIFICANCE OF IMPACT: Few bleeding-related terms are used in clinical practice. Absence of these terms has a high NPV for the absence of bleeding. These results suggest that a high throughput, rules-based NLP tool to identify bleeding is feasible.

2204

Evaluations of physiologic perturbations and their relationship with length of stay in neonatal hypoxic-ischemic encephalopathy

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OBJECTIVES/SPECIFIC AIMS: Neonatal hypoxic-ischemic encephalopathy (HIE) is frequently accompanied with physiologic perturbations and organ dysfunction. Markers of these perturbations and their associations with length of stay (LOS) are uncertain. To estimate the association between changes in selected physiologic and/or laboratory values with LOS in newborns with HIE. METHODS/STUDY POPULATION: Using the Children's Hospitals Neonatal Database (CHND), we identified neonates with HIE at our center born ≥36 weeks' gestation from 2010 to 2016. Those with major congenital anomalies were omitted. Infants uniformly received therapeutic hypothermia for 72 hours unless death occurred sooner. Inpatient vital signs and selected laboratory markers were collected from our institution's health informatics,

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electronic data warehouse (EDW) and then matched to records in CHND. With severity of HIE, gender, and confirmed seizures, each marker's association with LOS was calculated using multivariable Cox proportional hazards regression equations. These analyses were stratified by mortality. Candidate markers were vital signs, pulse oximetry, creatinine, acidosis (pH), international normalized ratio (INR), and supplemental oxygen (FiO_2). RESULTS/ANTICIPATED RESULTS: There were 66 eligible infants (38 males) and 1741 patient-days identified; Severe HIE (48%) and mortality (n = 21, 32%) were common. Overall, the median length of stay (mLOS) was 20.5 days (25th–75th centile: 10–31 days), although shorter for nonsurvivors [nonsurvivors mLOS = 8 days (5, 20); survivors mLOS = 24 days (14, 31), $p < 0.001$). Median birthweight and gestational age were 3.3 kg and 39.4 weeks' gestation, respectively. In survivors (n = 45, 1290 days), regression analyses demonstrated that none of the selected parameters were associated with LOS. Among nonsurvivors (n = 21, 451 days), diastolic blood pressure changes [hazard ratio (HR) = 0.93, 95% confidence interval (CI) = 0.88, 0.97, $p = 0.04$] was related to longer time of survival; conversely, temperature (HR = 2.0, 95% CI = 1.24, 3.26, $p = 0.005$) was related to shorter survival. Creatinine, pH, INR, FiO_2, or other vital signs were unrelated to time-to-death in nonsurvivors. DISCUSSION/SIGNIFICANCE OF IMPACT: In a pilot study of neonatal HIE, changes in physiologic values were related to duration of survival in nonsurvivors, while neither physiologic nor laboratory values were related to survivors' mLOS. These results both exemplify novel uses for disease-specific, exposure-outcome relationships using EDWs and incorporates required functionalities of required software patches to extract, clean, and report from clinical information captured in electronic health records. We anticipate that text mining with techniques such as natural language processing will augment associations and/or predictions of short-term outcomes.

2240

High-throughput phenotyping and the increased risk of OSA in Rosacia patients

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OBJECTIVES/SPECIFIC AIMS: To create a new semantically correct high-throughput phenotyping (HTP) platform. To demonstrate the utility of the HTP platform for observational research and can allow clinical investigators to perform studies in 5 minutes. To demonstrate the improved accuracy of observational research using this platform when compared with traditional observational research methods. To demonstrate that patients who have Roseacea are at increased risk of having obstructive sleep apnea (OSA). METHODS/STUDY POPULATION: This population is a set of 212,343 patients in the outpatient setting cared for in the Buffalo area over a 6-year period. All records for these patients were included in the study. Structured data was imported into an OMOP (OHDSI) database and all of the notes and reports were parsed by our HTP system which produces SNOMED CT codes. Each code is designated as a positive, negative or uncertain assertion and compositional expressions are automatically generated. We store the codified data 750,000,000 codes in Berkley DB, a NOSQL database, and we keep the compositional graphs in both Neo4J and in GraphDB (a triple store). Labs are coded in LOINC and drugs using RxNorm. We have developed a Web interface in .Net named BMI Search, which allows real-time query by subject matter experts. We analyzed the accuracy of structured Versus unstructured data by identifiying NVAF cases with ICD9 codes and then looked for any additional cases based on the SNOMED CT encodings of the clinical record. This was validated by 2 clinical human review of a set of 300 randomly selected cases. Separately we ran a study to determine the relative risk of OSA with and without Rosacea using the data set described above. We compared the rates using a Pearson χ^2 test. RESULTS/ANTICIPATED RESULTS: We are able to parse 7,000,000 records in an hour and a half on 1 node with 4 CPUs. This yielded 750,000,000 SNOMED CT codes. The HTP data set yielded 1849 cases using ICD9 codes and another 873 using the HTP-NLU data, leading to a final data set of 2722 cases from our population of 212,343 patients. In total, 580 patients had Rosacea;5443 patients had OSA without Rosacea and 51 patients had OSA with Rosacea. Patients with Rosaca had an 8.8% risk of OSA whereas patients without Rosacia only had a 2.6% risk of OSA. This was highly statistically significant with a $p < 0.0001$ (Pearson χ^2 test). The number needed to test was only 12. DISCUSSION/SIGNIFICANCE OF IMPACT: HTP can change how we do observational research and can lead to more accurate and more prolific investigation. This rapid turn around is part of what is necessary for both precision medicine and to create a learning health system. Patients with Rosacea are at increased risk of and should be screened for OSA.

2246

Characterization of resistant hypertension in a statewide electronic health record-based database (OneFlorida)

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OBJECTIVES/SPECIFIC AIMS: Our objective is to create a Resistant Hypertension (RHTN) computable phenotype from electronic health record (EHR)-based data, and to determine the characteristics associated with RHTN within a large, diverse, EHR-based database. METHODS/STUDY POPULATION: The OneFlorida Clinical Research Consortium includes 10 unique health care systems providing care for approximately half of the state (48%, ~10 million). OneFlorida houses a Data Trust which contains longitudinal EHR data and claims data from these providers in a common format, the PCORnet common data model v3.0. For the current project, data from 5 health care systems were considered. All of the adult hypertension (HTN) patients with a HTN diagnosis from an outpatient encounter were extracted from the OneFlorida Data Trust. Additional data such as demographics, prescribing, and vitals information were also extracted. The RHTN computable phenotype was created by constructing a drug exposure variable that took into consideration the number of antihypertensive medications an individual was prescribed at any point in time over the course of the OneFlorida dataset. RHTN was defined as any blood pressure requiring four or more antihypertensive drugs, or uncontrolled blood pressure (≥140/90) on 3 antihypertensive drugs. RHTN cases had to meet the definition criteria twice during the data period, at least 30 days apart. All data extraction, computation phenotype coding, and statistical analyses were conducted using SQL or SAS. RESULTS/ANTICIPATED RESULTS: Our preliminary results show that there were n = 342,026 adults with a HTN diagnosis from an outpatient visit in the data set. After the RHTN computable phenotype was constructed, n = 11,670 RHTN cases were identified from the n = 130,901 HTN individuals with all of the required variables in the data set (8.9% RHTN prevalence). In all, 55% of RHTN cases were Black or African American, compared with the total HTN population (25% Black/African American). RHTN cases also had more prescriptions for loop diuretics, centrally acting agents, α-blockers, and vasodilators compared with the total HTN population. Not surprisingly, the RHTN cases had 26% of the antihypertensive prescriptions in the data set, and the RHTN cases had fewer blood pressure readings that were in control (only 49.4% of readings <140/90). DISCUSSION/SIGNIFICANCE OF IMPACT: Overall, our preliminary data shows that it is possible to create the very complicated computable phenotype of RHTN within the OneFlorida Data Trust. We found that the RHTN prevalence in OneFlorida is 8.9% which is consistent with previous studies from NHANES. Although promising, these results require further validation of the computable phenotype and replication in other similar data sets in order to ascertain their true meaning. Once validated, the experience gained from this computable phenotype can be applied to many other phenotypes.

2278

Identifying causative mutations in Treacher Collins syndrome using iobio

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OBJECTIVES/SPECIFIC AIMS: The objective of the study was 2-fold; to identify potentially deleterious alleles in a child with Treacher Collins syndrome, and; to demonstrate the value of the iobio analysis platform for intuitively and rapidly analyzing genomic data. METHODS/STUDY POPULATION: We used the iobio suite of web-based applications to analyze quality metrics for the sequencing data and called variants for the proband and his parents. We then visually interrogated variants in genes potentially associated with the syndrome in real-time, using the intuitive gene.iobio application. We sought high impact variants that demonstrated a predicted impact on the protein function, and were simultaneously at low allele frequency in the general human population. Variants were also compared against the ClinVar database of known mutations to identify variants that have already been associated with this, or related syndromes in the literature or clinical studies. Finally, the gene.iobio tool allows users to interrogate the primary sequencing data to ensure that no variants had been missed by the primary variant calling pipeline. This analysis pipeline was performed using intuitive web-based apps in real time, and consequently represents a system that is available to users that traditionally are excluded from these analyses. RESULTS/ANTICIPATED RESULTS: The iobio suite was used to rapidly assess data quality and interrogate genetic variants for a child with

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Treacher Collins syndrome. A compound heterozygote consisting of 2 missense alleles in the TCOF1 gene was identified as a compelling pathogenic allele, necessitating further functional investigation. The study helped validate the use of the intuitive iobio tools in such analyses, strengthening the case for greater involvement of medical professionals in data analysis. DISCUSSION/SIGNIFICANCE OF IMPACT: The performed analyses demonstrated that the whole genome sequencing data for the family being studied was of a very high quality, although 1 gene demonstrated a local region of almost zero coverage. This ensured that study conclusions can be presented with confidence. A variant associated with Treacher Collins syndrome 1 in ClinVar was uncovered in the TCOF1 gene, however, given it's benign rating, this variant was not considered further. The most interesting candidate was a compound heterozygote, consisting of 2 missense mutations, also in the TCOF1 gene. These mutations occurred with allele frequencies of 22% and 8% in the general population, and additional molecular and functional studies are currently being pursued.

2286

HOME Cell 2.0. Extending i2b2 to support community health outcome monitoring and evaluation via web-accessible software

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OBJECTIVES/SPECIFIC AIMS: The primary objective of this effort is to develop and distribute an easy to use i2b2 component that is capable of evaluating diverse complex relationships for a wide variety of exposures and outcomes over time. In this manner we are able to leverage the unique design of the i2b2 database to support health services research, comparative effectiveness, and quality improvement using a single tool. Furthermore, our novel database redesign has the potential to provide user-friendly access to individual and group CHC data for CER. METHODS/STUDY POPULATION: For this project we used software experts, clinical informatics specialists, and the existing i2b2 open-source software to convert our legacy HOME Cell into a web-client version. The tool will be used to study health outcomes within a network of Boston based Community Health Centers and the largest safety-net hospital in New England, Boston Medical Center. RESULTS/ANTICIPATED RESULTS: The new web-client HOME Cell will allow i2b2 users to model virtually any exposure (including therapeutic interventions such as medications or tests) in i2b2 against any outcome accounting for complex temporal relationships and other factors. In addition we plan to use our new Community Health Center views to enhance our community engagement activities by allowing direct access to their data for our partners. DISCUSSION/SIGNIFICANCE OF IMPACT: Our project addresses multiple national priorities related to data sharing, clinical research informatics, and comparative effectiveness. The web-client version of the HOME Cell substantially improves our community's access to HOME Cell functionality and is a novel, sharable resource for use within the CTSA/NCATS community. Our approach provides a new way to perform large-scale collaborative research without the need to actually move patient-level data and has demonstrated that CER, health services research, and quality measurement can share a common framework. In addition, and as demonstrated in our earlier pilot work, the HOME Cell also has the potential to support large-scale multivariate analyses in a distributed manner that does not require sharing of patient-level data. We believe our approach has great promise for supporting the reuse of clinical data for rapid, transparent, health outcome assessments on a national scale. Our efforts support multiple strategic goals including: (1) support for building national clinical and translational research capacity by enhancing a broadly adopted informatics tool (i2b2); (2) enhanced consortium-wide collaborations by offering a tool that can be easily shared within the CTSA network to support multi-institutional collaboration; and (3) improving the health of our communities by offering a tool that has the potential to provide new insights into health care processes and outcomes that could drive innovation and improvement activities.

2289

Will the Veteran Affairs (VA) electronic medical records (EMR) database reveal a signal that angiotensin II inhibiting medications ameliorate depression?

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OBJECTIVES/SPECIFIC AIMS: Angiotensin type I receptor blockers (ARBs) and angiotensin-converting enzyme inhibitors (ACEIs) are frequently prescribed for hypertension and associated cardiovascular and renal complications. In animal models, these drugs also reduce anxiety and depression. OBJECTIVE—to determine if Veteran Affairs (VA) clinical pharmacy data indicate a protective effect of ARBs and/or ACEIs for major depression. METHODS/STUDY POPULATION: Pharmacy records from nationwide VA electronic medical records (EMR) were extracted for patients prescribed ARBs, ACEIs, α-blockers, β-blockers, calcium channel blockers, or diuretics (n = 4,081,359). Patients were excluded if: they had not received medications for 6 months with >70% coverage; were diagnosed with substance/alcohol abuse, dementia, psychosis, schizophrenia, or prescribed insulin. The study population was categorized as "ARB/ACEI" (A/A) or "Never ARB/ACEI" (NA/A). Using the Greedy Matching Algorithm, subjects were matched on a 1:1 ratio for sex and race over a 5 year age range resulting in 2 equal groups of n = 1,350,236 each. Subjects were older (M = 71.6, SD = 12) and mostly men (97%). RESULTS/ANTICIPATED RESULTS: In the A/A Versus NA/A, respectively, the incidence of anti-depressant use was greater during (9.9% vs. 8.9%) but was lower after (11.8% vs. 12.2%) the study period. PHQ-2 scores (Mean ± SD) were statistically lower, albeit similar, during (0.79 ± 1.56 vs. 0.85 ± 1.63) and after (1.00 ± 1.73 vs. 1.07 ± 1.79) the study period. DISCUSSION/SIGNIFICANCE OF IMPACT: These preliminary data suggest that inhibiting angiotensin II action does not provide a protective effect on major depression when compared with other classes of antihypertensive drugs. This study illustrates how "Big Data" may inform the design, or obviate the need, for large-scale randomized-controlled trials.

2293

Passive intracranial EEG-based localization of the central sulcus during sleep

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OBJECTIVES/SPECIFIC AIMS: To investigate the performance of a metric for passive localization of central sulcus. METHODS/STUDY POPULATION: We studied 7 patients with intractable epilepsy undergoing intra-cranial EEG (icEEG) monitoring at Yale, in whom central sulcus (CS) localization was obtained by standard methods. Our method takes advantage of inherent properties of the primary motor cortex (MC), which exhibits enhanced icEEG band-power and coherence across the CS. For each contact x we calculated the z-score of a composite power and synchrony value $\log_{10}(px)\,x$; cx, where px is sum of the root mean square of the icEEG in the high gamma band (80–115 Hz) for contact x over the 6–10 minutes of NREM sleep studied, and cx is the mean magnitude squared coherence in the same band using a 500-ms Hamming window between contact x and all other contacts. z-score values lower than threshold (th) were set to 0. Finally, we calculated a metric $m = z/d$, where d is the mean Euclidian distance of each contact from contacts with z scores greater than 0. The last step was implemented to emphasize local network activity. RESULTS/ANTICIPATED RESULTS: We report the results of a pilot study to test the performance of a new operator independent method for passive identification of CS with intractable epilepsy undergoing icEEG monitoring at Yale, in whom CS localization was obtained by standard methods. The sensori-motor (SM) cortex exhibited higher EEG-gamma power compared with non-SM cortex ($p < 0.0002$). There was no significant difference between the motor/premotor and sensory cortex ($p < 0.47$). CS was successfully localized in all patients with thresholds between 0.4 and 0.6. In 2 patients, knowledge of anatomy was needed to distinguish the MC from adjacent epileptic foci. The primary hand and leg motor areas exhibited the highest metric values consistently followed by the tongue motor area. Higher threshold values were very specific (94%) for the anterior bank of the CS but not sensitive. Intermediate threshold values achieved a reasonable trade-off (0.4: 89% specific and 70% sensitive). DISCUSSION/SIGNIFICANCE OF IMPACT: We present and successfully implement a rapid procedure for task-free and stimulation free localization of the central sulcus during sleep based on intrinsic electrophysiological properties of the primary motor strip which exhibits increased power and enhanced local connectivity. We successfully localized the central sulcus in all patients. When implementing appropriate thresholds, our proposed metric M is very specific for the anterior lip of the central sulcus which may make it ideal to identify this important anatomical landmark. Our method is sensitive for epileptogenic regions as well, therefore basic knowledge about central sulcus anatomy may be needed in cases where there is an epileptogenic lesion in the vicinity of the central suclus. Our method makes a few a priori assumptions: The regions around the central sulcus are adequately sampled and the occipital or parieto-occipital regions are not included in the analysis. In order for the method to function properly, nonsensori-MC should be sampled adequately as well. In the future, normative data could be generated for the composite product of connectivity × power which may replace within-patient z-scoring. Our method is rapid and can be implemented on short segments of

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ECoG data. The proposed method may be potentially used for identification of seeds in the motor cortex for subsequent network analysis and further studies may delineate its potential use in the operating room.

2296

Functional analysis of the cutaneous microbiome in psoriatic disease

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OBJECTIVES/SPECIFIC AIMS: Psoriasis is one of the most common inflammatory diseases of the skin, affecting about 2%–3% of the US population. Despite its high prevalence, its pathogenesis remains poorly understood. The ability of the microbiome to modify host immunity and metabolism suggests that it may contribute to the development of psoriasis and its cardiometabolic comorbidities. This study aims to characterize the psoriatic skin microbiome and understand the functional role that these bacteria may play. METHODS/STUDY POPULATION: 16s rRNA sequencing of site-matched skin swabs from 8 psoriasis patients and 8 healthy controls was used to identify bacteria and determine their relative abundance and microbial community diversity in the sample. PICRUSt was used to infer the functional roles of the bacteria from 16s rRNA amplicon data. RESULTS/ANTICIPATED RESULTS: Lesional psoriasis skin had lower α diversity ($p = 0.04$), less Actinobacteria ($p = 0.0001$), but higher Firmicutes ($p = 0.009$) compared with controls. At the genus level, lesional skin had more Alloiococcus ($p = 0.01$) and Aerococcus ($p = 0.01$) and demonstrated a trend towards lower Propionibacterium ($p = 0.08$) and higher Gallicola ($p = 0.09$) compared to controls. Interestingly, Alloiococcus ($p = 0.003$) and Gallicola ($p = 0.04$) were also higher in nonlesional skin compared with controls. Furthermore, lesional and nonlesional skin shared an increased abundance of *Acinetobacter* sp., *Staphylococcus pettenkoferi*, and *Streptococcus* sp., relative to controls. Lesional and nonlesional psoriasis skin did not differ significantly in microbiome composition. Predictive functional analysis revealed that both the healthy and psoriatic skin microbiome were enriched with bacteria capable of amino acid and carbohydrate metabolism suggest these functions might have a general role in host-microbe interaction. DISCUSSION/SIGNIFICANCE OF IMPACT: These data reveal intriguing differences in the cutaneous microbiome of psoriatic individuals and healthy controls and suggest that bacterial metabolism may play an important role in host-microbe interaction.

2327

Prescription opioid dependence in Western New York: Using data analytics to find an answer to the opioid epidemic

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OBJECTIVES/SPECIFIC AIMS: Dependence and abuse of prescription opioid pain medication has substantially increased over the last decade. The consistent rise in opioid dependence contributes to the rising prescription drug overdose deaths over the last decade. The study of the distribution and determinants of opioid dependence among patients who are treated with chronic pain medications prescribed by their healthcare providers would aid in answering some key questions about potential abuse and overdose on opioids. The descriptive epidemiology of opioid dependence would help in identifying the vulnerable age group, race, ethnicity, and type of opioid pain medications that more commonly result in dependence. METHODS/STUDY POPULATION: We implemented an Observational Medical Outcomes Partnership/Observational Health Data Sciences and Informatics (OMOP/OHDSI) database, to hold structured EHR data from our Allscripts patient records. We also created a high-throughput phenotyping, natural language processing system that can parse 7,000,000 clinical notes in 1.5 hours. This runs as a web service and provides a modular component based NLP system. After the full semantic parse, we match the content against any number of ontologies. For each match we tag it as either a positive, negative, or uncertain assertion. We then perform automated compositional expressions. The codes are stored in a Berkley database (BDB) NOSQL database and the compositional expressions are stored in Neo4J (a graph database) and Graph DB (a triple store). This flexibility allows rapid retrieval of complex questions in real time. The High-Throughput Phenotyping (HTP) Natural Language Processing (NLP) Subsystem (HTP-NLP) is software that produces, given biomedical text, semantic annotations of the text. The semantic annotations identify conceptual entities—their attributes, the relations they have with other entities and the events they participate in, as expressed in the input text. The conceptual entities, relations, attributes, and events identified are specified by various knowledge representations (KRs) as documented in Coding Sources. Examples of coding sources are medical terminologies [eg, SNOMED CT, RxNorm, LOINC and open biomedical ontologies (OBO) foundry ontologies, eg, gene ontology (GO), functional model of anatomy, OBI, and others]. The annotation results may be displayed or output in formats suitable for further processing. Entity identified is assigned a truth value from 0 to 1. Values from the text are assigned to entities from ontologies such as SNOMED CT. The retrospective analysis of EHR data from local clinic patients was performed using queries on the problem list, demographic data, and medication list of all the patients in the database. The OMOP/OHDSI database was collected from Allscripts EHRs from 2010 to 2015. This common data model helps in the systematic analysis of disparate observational databases of clinic records from the primary care and family medicine clinics in Western New York region. The database contained 212,343 patient records that were parsed and deidentified. Specific research IDs were assigned to each of the patient records and stored in a secure firewall device for data analytics. The entire 212,343 records were queried for opioid dependence from the ICD-9 and 10 diagnostic codes and SNOMED CT codes mapped to both the clinical notes and the problem list for each patient based on the mapped ICD and SNOMED CT codes. In total, 1356 patients were identified as to having opioid dependence. The records were stratified into 7 age groups from age 18 to 28 and ending with age 79–89 years. RESULTS/ANTICIPATED RESULTS: Of the 212,343 patients in the database 1356 patients revealed opioid dependence on the problem list, ICD9-10 codes and prescription opioid pain medication with or without Buprenorphine and Naloxone (Suboxone) in the medication list. The prevalence of opioid dependence in the clinic population was 0.64% (95% CI: 0.61%–0.67%) over a 5-year period. The 7,000,000 patient records generated 750,000,000 SNOMED CT codes (on average 107 codes per record). The highest numbers of opioid dependence were seen in the 29 to 38 years' age group. That comprised 39.38% (95% CI: 36.78%–41.98%) of the total opioid dependent population but accounted for only 2.03% of whole clinic population in this age group (95% CI: 1.86% to 2.2%). The subjects were then stratified by race and ethnicity. There were 1005 patients with opioid dependence, in the non-Hispanic population (total number 108,402). Among the White non-Hispanic or Latino population with opioid dependence, 41.33% (95% CI: 38.27%–44.39%) were 29–38 years old. The next common age group among the White Non-Hispanic opioid dependent subjects was 19–28 years, comprising of 22.48% (95% CI: 19.88%–25.08%) of the total number of White non-Hispanic or Latino opioid dependent population. Among the total clinic population Hispanics comprise 51.24%, but they comprise only 2.58% (95% CI: 1.74%–3.42%) of the total opioid dependent population. The non-Hispanic population comprise 51.05% of total clinic population while the percent of people who are opioid dependent is 83.26% (95% CI: 83.04%–83.48%) of the total 1356 opioid dependent population. DISCUSSION/SIGNIFICANCE OF IMPACT: The trends of opioid dependence among the clinic population in the study indicate that the prevalence is more in a certain section of the population. The predominance is among the non-Hispanic White population in the 19–38 years of age. The prevalence in younger age implies that the complications related to opioid dependence would be there for a longer duration of time. The prevalence of dependence in this clinic population would be rising if this trend continues. Interventions at curbing prescription opioid dependence is necessary for the vulnerable population. The findings suggest that a broad based approach is necessary to address this problem. The distribution of opioid dependence in this patient population indicate the need for special attention to these specific age group and race ethnicities. The young age of many of the addicted patients demonstrate the risks of legitimate opioid prescriptions in leading this age group towards addiction and implies the need for routine screening for substance abuse. The evidence of complications of opioid overdose among long-term opioid users and risk of abuse with other agents including illicit agents makes the need for an approach that uses real-time interventions in addition to effect long-term improvement in addiction rates. A potentially cost-effective approach to implement monitoring programs and clinical decision support tools would be to develop inter operable linkage from the EHRs to the state Department of Healths' prescription monitoring programs.

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Pioneering the pathway with big data to eliminate hepatitis C viral infection (EHCV)

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OBJECTIVES/SPECIFIC AIMS: Hepatitis C viral (HCV) infections are rising significantly both in young adults and as newly diagnosed cases in "baby boomers." New HCV therapeutics cure over 95% of cases, and a call has been

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made for elimination of the epidemic by 2030; yet major HCV cascade of care (CoC) barriers exist. We secured CTSA pilot funding to obtain preliminary data for an innovative clinical trial utilizing big data modeling toward HCV elimination. METHODS/STUDY POPULATION: Our pilot work has developed a coordinated, real-time clinical data management process across 3 major CTSA affiliated hospital systems (MedStar Health, Emory-Grady, and UT-Southwestern), and additional data will be obtained from a pragmatic clinical trial. Electronic medical records data will be mapped to the OHDSI model, securely transmitted to Oak Ridge National Laboratory, Knoxville, TN and exposed to integrated data, analytics, modeling and simulation (IDAMS). RESULTS/ANTICIPATED RESULTS: Our U01 CTSA application proposes that HCV-IDAMS will model modifications to the established HCV CoC at community and population levels and thus simulate future outcomes. As data volume increases, system knowledge will expand and recursive applications of IDAMS will increase the accuracy of our models. This will reveal real-world reactions contingent upon population dynamics and composition, geographies, and local applications of the HCV CoC. DISCUSSION/SIGNIFICANCE OF IMPACT: Only an innovative, integrated approach harnessing pragmatic clinical data, big data and supercomputing power can create a realistic model toward HCV elimination.

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openSESAME: a "search engine" for discovering drug-disease connections by leveraging publicly available high-throughput experimental data

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OBJECTIVES/SPECIFIC AIMS: Microarray technology has produced large volumes of gene expression data profiling differences in gene expression in a vast array of conditions, much of which is publicly available. Methods to query these data for similarities in patterns of gene regulation are limited to comparisons between preannotated groups. In response, we developed openSESAME to find experiments where a set of genes is similarly coregulated without regard to experimental design. An important application of openSESAME is drug repositioning: if a pattern associated with disease is reversed by a given drug, the drug might target disease-related processes. METHODS/STUDY POPULATION: Experiments from the Gene Expression Omnibus (GEO) were normalized, signature-association (SA) scores computed for each sample, experiments assigned enrichment scores, and ANOVAs used to assign significance to experimental variables automatically extracted from GEO. SA scores were also generated for hundreds of publicly available signatures, and pairwise correlations used to create a relevance network. RESULTS/ANTICIPATED RESULTS: Using signatures of estrogen and p63, we recovered relevant experimental variables, and with the network approach, we recovered previously reported associations between disease states and/or drug treatments. DISCUSSION/SIGNIFICANCE OF IMPACT: openSESAME has the potential to illuminate "dark data" and discover novel relationships between drugs and diseases on the basis of common patterns of differential gene expression.

2378

A scientometric analysis of CTSA collaboration and impact

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OBJECTIVES/SPECIFIC AIMS: Translational science supports the continuum of activities from early-stage bench research to implementation of discoveries for better and faster treatments to more patients. Past studies have attempted to clarify our understanding of the spectrum of translational research by categorizing the activities into stages ranging from T0 to T4 using explanatory definitions. Unfortunately, this approach is often vague and relies on a process of manual classification and binning of research publications into predetermined categories. This study aims to provide a big-picture analysis of clinical and translational science (CTS) based on an in-depth analysis of the entire corpus of publications resulting from research funded by Clinical and Translational Science Awards (CTSA) U54 awards (through 2016). METHODS/STUDY POPULATION: We harvested bibliographic metadata from all papers that cited any of the U54 award numbers since the inception of the CTSA program to the most recent award announcement. Natural language processing techniques were used to create term co-occurrence networks based on English-language textual data. Relevant and nonrelevant terms were distinguished algorithmically and processed accordingly to provide the clustered visualization. RESULTS/ANTICIPATED RESULTS: With this approach, we uncovered 6 natural clustered areas of emphasis of published CTS research, the evolution of specific concepts through time, and gained a better understanding of their relative impact as demonstrated by citations. We performed additional analyses including discipline-specific impact assessment; identification of categories of excellence relating to both productivity and citations; characteristics of collaborative networks such as organizational, industry, and international collaborations and network dynamics; and resulting global impact of the CTSA program. DISCUSSION/SIGNIFICANCE OF IMPACT: Ultimately we gained a clearer understanding of the CTSA program, its evolution through scholarly publications, and key areas of impact of the program using computational, data-driven evaluation methods.

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Predicting response to hemodynamic interventions in the ICU using recurrent neural networks

Julian Genkins and Thomas A. Lasko

OBJECTIVES/SPECIFIC AIMS: Our goal is to explore the value of learning algorithms to improve both the efficiency and accuracy of a clinician undertaking the cognitive task of selecting the best resuscitative intervention for a hemodynamically unstable patient in the ICU. Machine learning is an ideal discipline to solve this problem. The ICU is a data rich environment, however there is significant uncertainty regarding the interdependency of this data. Experts consistently struggle to develop deterministic models of the underlying forces driving hemodynamic perturbations and intervention responsiveness. Machine learning, especially deep learning, assumes no correlation between inputs. Deep architectures disentangle these high-level relationships through exposure to abundant, diverse data sets such as those used in this project, obviating the need to manually explore confounding interactions. METHODS/STUDY POPULATION: We are using the "Medical Information Mart for Intensive Care" (MIMIC-III) database for this project. MIMIC-III is a large, single-center database comprising information relating to patients admitted to critical care units at Beth Israel Deaconess Medical Center, a large tertiary care hospital, from 2001 to 2012. It contains data associated with 38,597 distinct adult patients and 53,423 distinct hospital admissions for those patients, with a mean of 4579 charted observations and 380 laboratory measurements available for each hospital admission. Classes of data in the MIMIC-III are varied and include billing, intervention, laboratory, medication, and physiologic data among others. In addition to training an RNN in the task of predicting hemodynamic states, we will also attempt to train 2 additional models on the same data—a multidimensional linear regression and a nonsequence-oriented deep neural network. For each of these models we will measure accuracy using root mean squared error (RMSE) and mean absolute error (MAE) to provide scale-dependent measurements of accuracy. RESULTS/ANTICIPATED RESULTS: Our results will be reported in 2 primary categories: numerical accuracy of the RNN model and applicability, utility, and accuracy in a live clinical setting. The use of RNNs in biomedical informatics, and in general, is a relatively new phenomenon. This means that the body of literature which could provide a basis for our expected results is limited. Because of this we have chosen staged goals in assessing our model. First, we hope to achieve a model that reliably predicts the direction of response. Being able to answer only the question of how a patient will respond—will they move toward or away from our therapeutic goal—is as good as existing prediction methods. It is well established in the literature that, by almost any metric, ~50% of hemodynamically unstable patients respond to a fluid challenge. If we are within 10% of this average (40%–60% respond), then we can be confident in the accuracy of our model in predicting direction. Upon achieving this, we will then measure accurate prediction of response magnitude. To this affect, we hope to achieve an RMSE <10% between our test data and corresponding predicted output before proceeding further. In addition to numeric accuracy, we acknowledge that a plan for practical, clinical validation is needed before utilizing this tool in a clinical environment. Such validation will require 3 separate components. First, numeric accuracy will need to be determined again as compared with prospective data on actual patients in the ICU. This step is critical to prove that no information leakage from target data back to input data occurred during training. Second, there must be a comparison to existing prediction methods, such as the passive leg raise in combination with measurement of cardiac output to predict volume responsiveness. Finally, we must measure the cost to the clinician of implementing our model in an ICU, specifically how it impacts their time to accomplish the task of selecting an intervention for the hemodynamically unstable patient. However, these tasks are beyond the scope of this project and will be left for later investigations. DISCUSSION/SIGNIFICANCE OF IMPACT: If we are successful, this study will provide the first step toward a data-driven model for predicting patient responsiveness to a given hemodynamic intervention or collection of interventions. As compared with current

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best practice maneuvers, this model will not require manipulation of the patient, have less rigid criteria for reliable interpretation, and not require as specific of a technical skillset to interpret. Furthermore, it will include many common categories of resuscitative therapies (eg, vasopressors, inotropes, fluids) and will allow effects of a combination of interventions to be predicted while making no assumptions of interdependence between said interventions. This study will also contribute a novel process of sequence prediction using RNNs by incorporating an element of context on top of the sequential data in every training step. An RNN learning the sequence of hemodynamic data comprising a patient's hemodynamic state would, alone, fit into the realm of sequence prediction. Our innovation is the addition of treatment information with each temporal division of the hemodynamic data. The result is an RNN that combines the task of sequence prediction with sequence translation, the 2 major use cases for RNN learning algorithms.

2413

Immune stress biomarkers correlate to violence and internalization of violence in African American young adults

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OBJECTIVES/SPECIFIC AIMS: Allostatic load, the chronic stress-induced wear and tear on the body, has a cumulative deleterious effect in individuals over their lifetime. Recent studies have suggested that socio-economic status, psychological determinants, and biomedical health cumulatively contribute to allostatic load in young adults. Although these finding individually suggest that African American children may be particularly susceptible to the effects of allostatic loading due to racially-based discrimination and economic instability, few studies have shown the effect of exposure to violence on the allostatic load carried by young African Americans. METHODS/STUDY POPULATION: The Biological and Social Correlates of Drug Use in African American Emerging Adults (BADU) data set is composed of young African Americans (n = 557 individuals) living in the Washington, DC area, collected from 2010 to 2012. Study participants were sought equally between males and females (n = 283, n = 274, respectively). This data set provides a rich source of information on the behavioral, mental, and physical health of African American young adults (18–25 year olds) living in the Washington, DC area. Analysis of 6 biomedical markers were measured in BADU study participants: C-reactive protein, cortisol, Epstein-Barr virus IgG, IgE, IgA, and IgM, known to be markers of immune stress and allostatic load. Naive Bayes was used to identify participant responses that were correlated to elevated stress biomarker levels. RESULTS/ANTICIPATED RESULTS: Violence was most closely correlated to elevated EBVVCA IgM and IgE levels. Elevated IgE levels correlated to increased experience of familial violence and sexual abuse; familial drug abuse and depression; violence and community violence. Cortisol is positively correlated to reported emotional state ($R = 0.072$) and perceived individual discrimination ($R = 0.059$). DISCUSSION/SIGNIFICANCE OF IMPACT: Allostatic load appears to be high in individuals who self-report exposure to violence. Both perceived mental health and violence were correlated to elevated stress biomarkers. When Epstein-Barr virus viral capsid antigen IgM was compared with violence features characterized in the data set, we found that internalization of environmental stressors were most strongly correlated to elevated allostatic load markers. This work suggests that internalization of experienced violence may be as important as the actual violence experience.

2416

A machine learning pipeline to predict acute kidney injury (AKI) in patients without AKI in their most recent hospitalization

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OBJECTIVES/SPECIFIC AIMS: Our objective was to develop and evaluate a machine learning pipeline that uses electronic health record (EHR) data to predict acute kidney injury (AKI) during rehospitalization for patients who did not have an AKI episode in their most recent hospitalization. METHODS/STUDY POPULATION: The protocol under which this study falls was given exempt status by our institutional review board. The fully deidentified data set, containing all adult hospital admissions during a 2-year period, is a combination of administrative, laboratory, and pharmaceutical information. The administrative data set includes International Classification of Diseases, 9th Revision (ICD-9) diagnosis and procedure codes, Current Procedural Terminology, 4th Edition (CPT-4) procedure codes, diagnosis-related grouping (DRG) codes, locations visited in the hospital, discharge disposition, insurance, marital status, gender, age, ethnicity, and total length of stay. The laboratory data set includes bicarbonate, chloride, calcium, anion gap, phosphate, glomerular filtration rate, creatinine, urea nitrogen, albumin, total protein, liver function enzymes, and hemoglobin A1c. The pharmacy data set includes, for each medication, a description, pharmacologic class and subclass, and therapeutic class. Data preprocessing was performed using Python library Pandas (McKinney, 2011). Top-level binary representation (Singh, 2015) was used for diagnosis and procedure codes. Categorical variables were transformed via 1-hot encoding. Previous admissions were collapsed using rules informed by domain expertise (eg, the most recent age or sum of assigned diagnosis codes were retained as elements in the feature vector). We excluded any patient without at least 1 rehospitalization during the time window. We excluded any admission with or without AKI where AKI was also present in the most recent hospitalization. For comparison, we do not exclude such admissions for an identical experiment in which we considered any AKI event as a positive sample (regardless of AKI presence in the most recent hospitalization). We defined an AKI event as an assignment of any of the acute kidney failure (AKF) ICD-9 codes [584.5, AKF with lesion of tubular necrosis, 584.6, AKF with lesion of renal cortical necrosis, 584.7, AKF with lesion of renal medullary (papillary) necrosis, 584.8, AKF with other specified pathological lesion in kidney, or 584.9, AKF, unspecified]. Since diagnosis codes are believed to be specific but not sensitive for AKI (Waikar, 2006), we supplemented them using creatinine for patients who had laboratory values. Diagnosis was made according to the Kidney Disease: Improving Global Outcomes (KDIGO) Practice Guidelines (AKI defined as a 1.5-fold or greater increase in serum creatinine from baseline within 7 d or 0.3 mg/dL or greater increase in serum creatinine within 48 h). We report preliminary model discrimination via area under the receiver operating characteristic curve (AUC) using k-fold cross validation grouped by patient identifier (to ensure that admissions from the same patient would not appear in the training and validation set). It was confirmed that the prevalence of positive samples in the entire data set was maintained in each fold. Python library Sci-kit Learn (Pedregosa, 2011) was used for pipeline development, which consisted of imputation, scaling, and hyper-parameter tuning for penalized (l1 and l2 norm) logistic regression, random forest, and multilayer perceptron classifiers. All experiments were stored in IPython (Pérez, 2007) notebooks for easy viewing and result reproduction. RESULTS/ANTICIPATED RESULTS: There were 107,036 adult patients that accounted for 199,545 admissions during a 2-year window. Per admission, there were at most 54 ICD-9 diagnoses, 38 ICD-9 procedures, 314 CPT-4 procedures, and 25 hospital locations visited. The admissions were 55% female, the average age was 46 ± standard deviation 20, and average length of stay was 2.5 ± 8.0 days. We excluded 2360 admissions that involved an AKI event that directly followed an admission with an AKI event and 4130 admissions that did not involve an AKI event but directly followed an admission with an AKI event. In total, there were 4561 (5.3%) positive samples (AKI during rehospitalization without AKI in the previous stay) generated by 3699 unique patients and 81,458 negative samples (non-AKI during rehospitalization without AKI in the previous stay) generated by 31,831 unique patients. When using any AKI event as a positive sample (regardless of whether or not AKI was in the most recent stay), the prevalence was 7.3% (6921 positive samples generated by 4395 unique patients and 85,588 negative samples generated by 33,287 unique patients). Best results were achieved with a code precision of 3 digits for which we had a total of 4556 features per patient. Fitted hyper-parameters corresponding to each classifier were logistic regression with l1 penalty C as 2×10^{-3}; logistic regression with l2 penalty C as 1×10^{-6}; random forest number of estimators as 100, maximum depth as 3, minimum samples per leaf as 50, minimum samples per split as 10, and entropy as the splitting criterion; and multilayer perceptron l2 regularization parameter α as 15, architecture as 1 hidden layer with 5 units, and learning rate as 0.001. Five-fold stratified cross validation on the development set yielded AUC for logistic regression with l1 penalty average 0.830 ± 0.006, logistic regression with l2 penalty 0.796 ± 0.007, random forest 0.828 ± 0.007, and multilayer perceptron 0.841 ± 0.005. In an identical experiment for which an AKI event was considered a positive sample regardless of AKI presence in the most recent stay, we had 4592 features per sample with the same code precision. Five-fold stratified cross validation on the development set with identical settings for the hyper-parameters yielded AUC for logistic regression with l1 penalty average 0.850 ± 0.004, logistic regression with l2 penalty 0.819 ± 0.006, random forest 0.853 ± 0.004, and multilayer perceptron 0.853 ± 0.006. DISCUSSION/SIGNIFICANCE OF IMPACT: Our objective was to investigate the feasibility of using machine learning methods on EHR data to provide a personalized risk assessment for "unexpected" AKI in rehospitalized patients. Preliminary model discrimination was good, suggesting that this approach is feasible. Such a model could aid clinicians to recognize AKI risk in unsuspicious patients. The authors recognize several limitations. Since our data set corresponds to a time-window sample, patients with high frequency of hospital utilization are likely over-represented. Similarly, our data set contains records from only 1 hospital

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network. Although we supplement with laboratory-based diagnosis, using diagnosis codes as labels is problematic as numerous reports suggest low sensitivity of codes for AKI. Future work includes calibration analysis, incremental updating ("online learning"), and a representation learning-based ("deep learning") extension of the model.

2456

Genetic determinants of recovery after mild traumatic brain injury: Can study samples be identified from electronic medical records linked to DNA biobanks?

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OBJECTIVES/SPECIFIC AIMS: To develop an algorithm that identifies post-concussion syndrome (PCS) cases and controls from among patients with mild traumatic brain injury (mTBI) in a large academic biobank. METHODS/STUDY POPULATION: The Vanderbilt University Medical Center's (VUMC) electronic medical record (EMR) research database includes longitudinal medical record data on 2.5 million people. DNA and genotype data were also available for >225,000 of these individuals. Our algorithm used a combination of billing codes and natural language processing to apply inclusion and exclusion criteria. We defined PCS cases as those with a PCS billing code (ICD-9 310.2 or ICD-10 F07.81) and/or symptoms of PCS within 1–6 months of a qualifying mTBI. We will compare the positive predictive value of our algorithm to that of 2 simpler case selection schemes: (1) 1 instance of the PCS billing code anywhere in the medical record; and (2) 2 or more instances of the PCS billing code anywhere in the medical record. RESULTS/ANTICIPATED RESULTS: An mTBI was diagnosed in 28,720 patients regularly attending VUMC, and 528 of these patients were classified as PCS cases by our algorithm. The characteristics of our EMR sample reflected known risk factors for PCS. Our cases were more likely than controls to be female (49.4% vs. 38.4%), to have sustained a previous TBI (31.0% vs. 12.0%) and to have comorbid mood disorders. Our PCS cases were also more likely than controls to be <18 years of age (42.4% vs. 33.6%) and to have a sports-related keyword associated with the mTBI (44.1% vs. 25.2%), emphasizing the relevance of PCS to young athletes. Nonetheless, the number of PCS cases identified by our algorithm was small, and within the VUMC EMR, there were 5039 patients with 1 PCS billing code, and 2457 patients with 2 or more PCS billing codes anywhere in their EMR. Our next step is to calculate the positive predictive values of each selection scheme by manually reviewing the EMR of a selection of cases. Ultimately, we will implement the selection scheme that maximizes both positive predictive value and sample size, and in future work, we will genotype the selected patients to better understand the genetic architecture of PCS. DISCUSSION/SIGNIFICANCE OF IMPACT: EMR and biobanks are the future of human health research, and we asked whether complex algorithms or simple billing codes were best for studying the genetics of recovery after mTBI within the VUMC EMR. Our results are relevant to other studies of brain injury phenotypes within biobanks, including recovery from moderate or severe TBI, recovery from stroke, or the occurrence of delirium after routine surgery, and will help transform biobanks into fruitful research tools.

2465

The design of a patient-centered personal health record with patients as co-designers

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OBJECTIVES/SPECIFIC AIMS: The promise and potential of connected personal health records (PHRs) has not come to fruition. This may be, in part, due to the lack of user-centered design and of a patient-centric approach to curating personal health data for use by patients. Co-design with end-users could help mitigate these issues by ensuring the software meets user's needs, and also engages patients in informatics research. Our team partnered with patients with multiple chronic conditions to co-design a patient-centric PHR. This abstract will describe our experience with the co-design process, highlight functionalities desired by patients, and showcase the final prototype. METHODS/STUDY POPULATION: We conducted 3 design sessions (90 min per session) with patients as co-designers and employed an iterative process for software development. Patients were recruited from Chapel Hill and surrounding areas. The initial design session laid the foundation for future sessions, and began with brainstorming about what patients thought their ideal version of an engaging connected PHR would look like in terms of features and functionalities. After each software iteration, our entire design team, including our patient co-designers, was shown the prototype during a subsequent design session. Once the final prototype was developed, usability testing was conducted with patient participants. Our team then conducted a final design session to debrief about the final prototype. RESULTS/ANTICIPATED RESULTS: We started with an initial group of 12 patients (6 males) who all had diabetes and an additional comorbidity such as hypertension and hyperlipidemia. Age of participants ranged from 30 to 77 years with an average age of 56. The majority of participants were Caucasian with 1 Asian and 2 African Americans. Hemoglobin A1c values ranged from 6.0% to 9.2% with approximately half having A1c values less than the goal of 7.0%. Half the patients were aware of PHRs, majority had smartphones, and all participants had access to the Internet and used email. Two of the patients were retired engineers who had prior experience with software design. The other sessions had between 7 and 8 participants at each session, and 7 patients completed the 90-minute usability testing session. There was a core group of 7 patients who were engaged in the design and testing sessions throughout the entire 9-month study. Key features of the PHR that emerged from design sessions included the following: (1) allow for annotation of data by patients (particularly important for lab values like glucose or for physical activity); (2) calendars, to do list, and reminder functions should be linked so that an entry in one of these allows for auto-population of this data within the other sections; (3) notifications whenever new data from the electronic health record or other sources are pushed to the PHR account; (4) allow for drag and drop of photos of pills/medications taken via smartphone or from other sources so that medication list has photo of actual pills or pill bottle; (5) allow for patients to customize the order of sections in the PHR dashboard so that the sections most important to the individual patient can be displayed more prominently; (6) allow for notifications from pharmacies to be pushed to the PHR (eg, confirmation of receipt of prescription requests or alert that prescription is ready to pick up); and (7) graphical display of trends over time (patients would like to select the measures and time frames to plot for display). Patients cited the importance of data provenance so that patient-entered data Versus provider or electronic health record data could be easily differentiated. Patients also highlighted the importance of having this PHR be a "one-stop shop for all their health data" and to have meaningful data dashboards for the different types of information needed to comprehensively manage their health. Patients wished for a single PHR that could easily bring together data from multiple patient portal accounts to avoid having to manage multiple accounts and passwords. They felt that heat map displays such as those used on popular fitness tracking websites were not intuitive and that the color-coding made interpretation challenging. Participants noted that engagement in the design process made them feel that they contributed towards developing software that could not only positively impact them individually but others as well. Every patient indicated the desire to participate on future design projects. Of the 19 tasks evaluated during usability testing, only 5 tasks could not be completed (eg, adding exercise to the calendar, opening the heat map, etc.). Patients felt that the overall PHR design was clean and aesthetically pleasing. Most patients felt that the site was "pretty easy to use" (6 out of 7). The majority of participants would like to use this PHR in the future (5) and would recommend this PHR to their friends/family to use (6). DISCUSSION/SIGNIFICANCE OF IMPACT: Involving patients directly in the design process for creating a patient-centric connected PHR was essential to sustaining engagement throughout the software life cycle and to informing the design of features and functionalities desired by patients with chronic conditions.

2469

Streamlining study design and statistical analysis for quality improvement and research reproducibility

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OBJECTIVES/SPECIFIC AIMS: Key factors causing irreproducibility of research include those related to inappropriate study design methodologies and statistical analysis. In modern statistical practice irreproducibility could arise due to statistical (false discoveries, p-hacking, overuse/misuse of *p*-values, low power, poor experimental design) and computational (data, code and software management) issues. These require understanding the processes and workflows practiced by an organization, and the development and use of metrics to quantify reproducibility. METHODS/STUDY POPULATION: Within the Foundation of Discovery – Population Health Research, Center for Clinical and Translational Science, University of Utah, we are undertaking a project to

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streamline the study design and statistical analysis workflows and processes. As a first step we met with key stakeholders to understand the current practices by eliciting example statistical projects, and then developed process information models for different types of statistical needs using Lucidchart. We then reviewed these with the Foundation's leadership and the Standards Committee to come up with ideal workflows and model, and defined key measurement points (such as those around study design, analysis plan, final report, requirements for quality checks, and double coding) for assessing reproducibility. As next steps we are using our finding to embed analytical and infrastructural approaches within the statisticians' workflows. This will include data and code dissemination platforms such as Box, Bitbucket, and GitHub, documentation platforms such as Confluence, and workflow tracking platforms such as Jira. These tools will simplify and automate the capture of communications as a statistician work through a project. Data-intensive process will use process-workflow management platforms such as Activiti, Pegasus, and Taverna. RESULTS/ANTICIPATED RESULTS: These strategies for sharing and publishing study protocols, data, code, and results across the spectrum, active collaboration with the research team, automation of key steps, along with decision support. DISCUSSION/SIGNIFICANCE OF IMPACT: This analysis of statistical methods and process and computational methods to automate them ensure quality of statistical methods and reproducibility of research.

2476

Identifying strangulated small bowel obstruction with machine learning

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OBJECTIVES/SPECIFIC AIMS: Historically, logistic regression algorithms (LRAs) have failed to differentiate strangulated small bowel obstructions (SBOs) from nonstrangulated SBOs. Our hypothesis is that a machine learning algorithm (MLA) can differentiate strangulated from simple SBOs better than an LRA can. METHODS/STUDY POPULATION: We used records of patients presenting with acute SBO and managed with exploratory laparotomy to test and train algorithms. We compared MLA to LRA via area under the receiver operating characteristic curve (AUROC) and cut-off points maximizing sensitivity and specificity. RESULTS/ANTICIPATED RESULTS: With 192 patient records, the AUROC of the MLA was 0.85. At the sensitivity cutoff, the MLA had 100% sensitivity and 55% specificity. At the specificity cutoff, the MLA had 45% sensitivity and 100% specificity. We anticipate improvements as more records are incorporated, and that LRA will underperform MLA across all measures. DISCUSSION/SIGNIFICANCE OF IMPACT: Our MLA represents a significant improvement over past LRAs, and may provide decision assistance to surgeons managing SBO. If this MLA maintains its high sensitivity, it may be used in the future to prevent unnecessary surgeries.

2492

Leveraging CTSA informatics capacity to expand global health engagement and research capacity in Latin America and the Pacific

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OBJECTIVES/SPECIFIC AIMS: The objective of this partnership was to create a global network of clinical and public health researchers and communities conducting technology-assisted research in noncommunicable disease. METHODS/STUDY POPULATION: The University of Rochester's Clinical and Translational Science Institute (CTSI) has successfully leveraged the informatics core's capacity into an emerging network of organizations that focus on technology and health in settings outside of the mainland United States. The CTSI coordinated with another NIH-funded infrastructure program [the RCMI Translational Research Network (RTRN)] to identify partner institutions interested in technology and health. RTRN identified the University of Puerto Rico and the University of Hawaii, both of which serve as hubs for common research interests in technology and health throughout the Caribbean and the Pacific. This network was formalized as the CDC's Coordinating Center for its Global and Territorial Health Research Network (the "Global Network"), with additional US partners (Yale, University of Illinois at Chicago, University of North Caroline Chapel Hill, and the University of South Florida) within a wider scope of the CDC's Prevention Research Centers (PRC) program. RESULTS/ANTICIPATED RESULTS: Through combining 2 main NIH-funded research infrastructure networks (CTSA and RTRN), with a large CDC-funded PRC, the University of Rochester's Informatics Core was successful in establishing a new productive global health network throughout Latin America and the Caribbean, and in the Pacific, garnering additional research support from NIH Fogarty and other programs. The resulting network not only supports locally-important research in technology and health on compelling health issues (eg, diabetes, ZIka, participation in research), but also facilitates community engagement through local partnerships and the cores of the involved networks. In addition, much of the information and communications technology (ICT)-related research and learnings from the Global Network activity is immediately applicable to populations in the United States, served by the various collaborative networks. In total, while new, the Global Network supports a wide range of projects and engagements throughout the world that expand local informatics capacity and use of technology in the research process and to address global health problems, further enhancing the CTSI's informatics core to serve the needs of its own constituency and promote research engagement with technology within this population. Local research collaborative projects reinforce the utility of the network and its resources, evidenced by tools, publications, partnerships, and conference presentations that have arisen. Lessons to date from this Global Network collaboration include: specific global research projects provide opportunities for partnership building and meaningful collaboration, team science is of central importance in distributing the work of the network, synergy is multidirectional with expertise and need flowing in all directions, and project team members in all locales learned and contributed substantially in ways that carried into their other responsibilities. DISCUSSION/SIGNIFICANCE OF IMPACT: The overall partnership has created opportunity for South-South collaboration, for adaptation of projects among locales, and has helped boost reputational value for all partners involved. Implications for other CTSA awardees include: global collaboration can serve core research and technical needs for the CTSA itself and its local partners, CTSA status can be leveraged to access resources to support local research, and collaboration in other federally-funded research networks helps expand the insight, scope, and potential for new research.

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Individual patient outcome predictions using supervised learning methods

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OBJECTIVES/SPECIFIC AIMS: To learn the edit distance costs of a symbolic univariate time series representation through a stochastic finite-state transducer to predict patient outcomes in intensive care units. METHODS/STUDY POPULATION: High frequency data of patients in intensive care units were used as a data set. The nearest neighbor method with edit distance costs (learned by the FST) were used to classify the patient status within an hour after 10 hours of data. Several experiments were developed to estimate the parameters that better fit the model regarding the prediction metrics. RESULTS/ANTICIPATED RESULTS: Different metrics were obtained for the several parameters. These metrics were metrics (ie, accuracy, precision, and F-measure). DISCUSSION/SIGNIFICANCE OF IMPACT: Our best results are compared with published works, where most of the metrics (ie, accuracy, precision, and F-measure) were improved.

2505

Understanding quality of life transitions for women: Assessing the impact of EPIC decision support tools to address untreated menopausal symptoms on women's quality of life and provider workflow

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OBJECTIVES/SPECIFIC AIMS: The goal of this study is to assess how quality of life scores change in menopausal women before and after implementation of this aid. In addition, we are also interested in 2 process evaluation objectives: (1) determine if MyChart, the patient portal, is an effective way for this patient population to provide insight their quality of life to their providers and (2) to evaluate providers use of and reactions to the decision support tool. METHODS/STUDY POPULATION: This project is a collaboration between University of Rochester Medical Center and S.U.N.Y. Upstate Medical

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University. Participants were recruited through Upstate's Family Medicine and OB/GYN practices via a MyChart invitation sent by the practices. Participating patients will be asked to complete a survey, through MyChart, every 3 months for 18 months. Participating health providers will be trained to use the decision support tool and participate in 3 interviews with the researchers to gain insight into the usefulness and effectiveness of the tool. RESULTS/ANTICIPATED RESULTS: Of the 465 eligible women, 117 women responded to our MyChart invitation to join our study. Of these, 105 agreed to participate and 98 met eligibility criteria. Only half of the women currently enrolled in our study had spoken to a provider about menopause related symptoms (56.1%) prior to study enrollment. DISCUSSION/SIGNIFICANCE OF IMPACT: The goal of this study is to improve menopause related symptoms in women, thus increasing their quality of life, but it will also provide important process evaluation for using EPIC and MyChart for future research studies.

2506

Using Amazon's Mechanical Turk as a tool for a global survey: Lessons learned from a large-scale implementation

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OBJECTIVES/SPECIFIC AIMS: To share lessons learned from implementing a health survey to a global sample of mTWs. METHODS/STUDY POPULATION: mTWs were paid $0.50 for taking a 15 minute survey to ascertain attitudes and intentions toward participating in genetic research. Two phases included: pilot survey targeting 7 global regions and a large-scale implementation in English in United States, India, and other countries and in Spanish in Spanish speaking countries. Administrative and descriptive information were collected and analyzed by region/country including: completions by location, demographics, time to complete, and survey satisfaction. RESULTS/ANTICIPATED RESULTS: There are 4 key lessons: (1) MTurk is fast. The US sample ($n = 505$) accrual took <2 days and the Indian sample ($n = 505$) took 11 days, while the response from other countries ($n = 118$) generally exceeded 30 days. (2) Using Amazon country specification was the best way to ensure responses from specific countries and regions. (3) Demographic differences exist in mTWs between countries. For example, US mTWs were significantly more likely female (60.1%) compared with India (30.2%) and other countries (34.2%). (4) mTWs found the survey understandable/acceptable. mTWs reported high understandability and acceptability of the survey, which did not vary significantly across countries or by language. DISCUSSION/SIGNIFICANCE OF IMPACT: mTurk provides an efficient platform for survey research from diverse US and Indian samples. In other countries and in Spanish, the mTurk mechanism yielded a smaller sample more slowly but was still effective.

2507

Towards a scalable informatics platform for enhancing accrual into clinical research studies

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OBJECTIVES/SPECIFIC AIMS: Issues with recruiting the targeted number of participants in a timely manner often results in underpowered studies, with more than 60% of clinical studies failing to complete or requiring extensions due to enrollment issues. The objective of this study is to develop and implement a scalable, organization wide platform to enhance accrual into clinical research studies. METHODS/STUDY POPULATION: We are developing and evaluating an informatics platform called Utah Utility for Research Recruitment (U2R2). U2R2 consists of 2 components: (i) Semantic Matcher: an automated trial criterion to patient matching component that also reports uncertainty associated with the match, and (ii) Match Delivery: mechanisms to deliver the list of matched patients for different research and clinical settings. As a first step, we limited the Semantic Matcher to utilize only structured data elements from the patient record and trial criteria. We are now including distributional semantic methods to match complete patient records and trial criteria as documents. We evaluated the first phase of U2R2 based on a randomized trial with a target enrollment of 220 participants that compares 2 treatment strategies for managing back pain (physical therapy and usual care) for individuals consulting a nonsurgical provider and symptomatic <90 days. RESULTS/ANTICIPATED RESULTS: U2R2 identified 9370 patients from the University of Utah Hospitals and Clinics as potential matches. Of these 9370, 1145 responded to the Back Pain study research team's email or phone communications, and were further screened by phone. In total, 250 participants completed a screening visit, resulting in the current study enrollment of 130 participants. Forty-three of 1145 patients refused to participate, and 50 participants no-showed their screening visit. DISCUSSION/SIGNIFICANCE OF IMPACT: A recruitment platform can enhance potential participant identification, but requires attention to multiple issues involved with clinical research studies. Clinical eligibility criteria are usually unstructured and require human mediation and abstraction into discrete data elements for matching against patient records. In addition, key eligibility data are often embedded within text in the patient record. Distributional semantic approaches, by leveraging this content, can identify potential participants for screening with more specificity. The delivery of the list of matched patient results should consider characteristics of the research study, population, and targeted enrollment (eg, back pain being a common disorder and the possibility of the patient visiting different types of clinics), as well as organizational and socio-technical issues surrounding clinical practice and research. Embedding the delivery of match results into the clinical workflow by utilizing user-centered design approaches and involving the clinician, the clinic, and the patient in the recruitment process, could yield higher accrual indices.

2510

QIPR: Creating a Quality Improvement Project Registry

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OBJECTIVES/SPECIFIC AIMS: To create a searchable public registry of all Quality Improvement (QI) projects. To incentivize the medical professionals at UF Health to initiate quality improvement projects by reducing startup burden and providing a path to publishing results. To reduce the review effort performed by the internal review board on projects that are quality improvement Versus research. To foster publication of completed quality improvement projects. To assist the UF Health Sebastian Ferrero Office of Clinical Quality & Patient Safety in managing quality improvement across the hospital system. METHODS/STUDY POPULATION: This project used a variant of the spiral software development model and principles from the ADDIE instructional design process for the creation of a registry that is web based. To understand the current registration process and management of quality projects in the UF Health system a needs assessment was performed with the UF Health Sebastian Ferrero Office of Clinical Quality & Patient Safety to gather project requirements. Biweekly meetings were held between the Quality Improvement office and the Clinical and Translational Science – Informatics and Technology teams during the entire project. Our primary goal was to collect just enough information to answer the basic questions of who is doing which QI project, what department are they from, what are the most basic details about the type of project and who is involved. We also wanted to create incentive in the user group to try to find an existing project to join or to commit the details of their proposed new project to a data registry for others to find to reduce the amount of duplicate QI projects. We created a series of design templates for further customization and feature discovery. We then proceed with the development of the registry using a Python web development framework called Django, which is a technology that powers Pinterest and the Washington Post Web sites. The application is broken down into 2 main components (i) data input, where information is collected from clinical staff, Nurses, Pharmacists, Residents, and Doctors on what quality improvement projects they intend to complete and (ii) project registry, where completed or "registered" projects can be viewed and searched publicly. The registry consists of a quality investigator profile that lists contact information, expertise, and areas of interest. A dashboard allows for the creation and review of quality improvement projects. A search function enables certain quality project details to be publicly accessible to encourage collaboration. We developed the Registry Matching Algorithm which is based on the Jaccard similarity coefficient that uses quality project features to find similar quality projects. The algorithm allows for quality investigators to find existing or previous quality improvement projects to encourage collaboration and to reduce repeat projects. We also developed the QIPR Approver Algorithm that guides the investigator through a series of questions that allows an appropriate quality project to get approved to start without the need for human intervention. RESULTS/ANTICIPATED RESULTS: A product of this project is an open source software package that is freely available on GitHub for distribution to other health systems under the Apache 2.0 open source license. Adoption of the Quality Improvement Project Registry and promotion of it to the intended audience are important factors for the success of this registry. Thanks goes to the UW-Madison

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and their QI/Program Evaluation Self-Certification Tool (https://uwmadison.co1.qualtrics.com/SE/?SID=SV_3lVeNuKe8FhKc73) used as example and inspiration for this project. DISCUSSION/SIGNIFICANCE OF IMPACT: This registry was created to help understand the impact of improved management of quality projects in a hospital system. The ultimate result will be to reduce time to approve quality improvement projects, increase collaboration across the UF Health Hospital system, reduce redundancy of quality improvement projects and translate more projects into publications.

2514

Governance for a decentralized informatics academic environment

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OBJECTIVES/SPECIFIC AIMS: Due to scope and breadth of research activity and infrastructure capacities at academic medical centers, the discipline of Biomedical Informatics is often deployed in a decentralized manner through geographically dispersed and unrelated organizational units. As a result, without a conscious strategy, an academic medical center risks redundant effort and gaps in resources, and perhaps poor coordination. A mechanism to bring together disparate organizational entities to identify, discuss, and negotiate Informatics-related concerns may produce a better institutional research environment. The University of Rochester (UR) has implemented such a strategy of Informatics governance, adapting tactics from team science, diplomacy, and deliberative engagement. METHODS/STUDY POPULATION: Based on current needs and institutional Informatics priorities, the UR's Clinical and Translational Science Institute (CTSI) established 6 Informatics "clusters" in distinct but deliberately overlapping focal areas: (1) Data—capture, management, and analysis of all types of data for research. (2) Analytics—quantitative research across the spectrum of translational research. (3) Infrastructure—technical and computing infrastructure to support informatics. (4) Electronic health records (EHR)—(i) features within the EHR explicitly designed to address the needs of research; (ii) accessing and procuring EHR data for research. (5) Population health—Informatics design and systems expertise relevant to population health research (a key CTSI focus area). (6) Education—development, deployment, and assessment of Informatics learning opportunities for learners at all levels. Each cluster facilitates access to expertise and resources around the institution, promotes collaboration, identifies redundancy, and serves as a forum to strategize regarding institutional needs related to Biomedical Informatics. A CTSI faculty or staff member leads each cluster. To maximize effectiveness of the cluster, other members are decision-makers in the organizations they represent, or serve in a critical staff function. Clusters meet in person on a quarterly basis with more frequent electronic interaction. The clusters share documents via Box, a secure online file sharing app. The cluster coordinators meet as a group on a biweekly basis to monitor progress and make plans. RESULTS/ANTICIPATED RESULTS: There were 45 different people representing 46 distinct centers, departments or offices, and 2 outside agencies agreed to participate in the clusters. In total, 20 people represented a single organizational unit; 15 represented 2 units; 8 represented 3 units, and 2 represented 4 units. The richness and complexity of these organizational linkages illustrates the decentralized nature of Informatics at the institution and the promise of the cluster approach. DISCUSSION/SIGNIFICANCE OF IMPACT: Adapting to a decentralized Informatics environment, the CTSI established clusters that recognize and respect autonomy and capacity of a wide range of units throughout the university, creating a collaborative atmosphere for steering and implementing an overall Informatics vision. As Informatics capacity rapidly expands throughout growing biomedical research institutions without a centralized Informatics hub, this distributed, deliberative approach could offer an effective governance solution that promotes cooperation. In this model, the CTSI provides the leadership and staffing necessary to ensure progress at the institutional level around Informatics and creates a venue for communication and coordination on Informatics-related topics.

2527

Citation network towards faculty development inside and outside of CTSAs

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OBJECTIVES/SPECIFIC AIMS: (1) Obtain publically available citation data, funding data, and generate multiple networks topologies based on dynamic queries of individual faculty. (2) Determine successful pathways that lead to tenure, and career advancement, in addition to determining the effect of CTSA programs on faculty collaboration. (3) Develop publically available commercial interface for the study of faculty networks METHODS/STUDY POPULATION: For our study we included all available citation and funding data publically available on all CTSA programs (as of 2015) with historical data dating back to 2005. We then included the top 25 collegiate institutions who may not have had a CTSA program (eg, Princeton University). We then developed network topologies for each university network, and explore the evolution of individuals in these networks, and the effects of faculty development—as an example in the University of Rochester network, we singled out the directors of the CTSA program there to understand their level of centrality and overall impact on network development, with key observations being that early publications across varying domains lead to stronger network performance. Although individuals who did not benefit from such development, may have succeeded but if they did were likely to leave the institution for elsewhere. RESULTS/ANTICIPATED RESULTS: A secondary goal of this project is to evaluate the effectiveness of the Clinical & Translational Science Institute (CTSI) since its inception in 2006. The mission of CTSI is to advance the field of translational science and research, to link other departments at URMC and community stakeholders by research collaboration, publication, and goals to improve population health, and provide translational education and training to students, researchers, and physicians. To determine how the induction of CTSI affects collaboration within the URMC network, we examined the role of funding in the CTSI network. This was done around the second successful funding around 2013. In doing so we can see that not only did the funding request affect the network topology, but opened new collaborations which were not present prior to the request. DISCUSSION/SIGNIFICANCE OF IMPACT: We have developed an automated method, which is superior to manual methods necessary for citation generation and funding data analysis of faculty growth in citation networks. This technique is applicable to all institutions, not just those in a CTSA environment, but demonstrates the benefit of cross-collaborative efforts, in the case of the URMC network we can state the following. The key takeaway is for individuals to succeed in the URMC collaborative environment they should create their own network and expand it and eventually rise to prominence. There are 2 pathways to this you can take the Dewhurst approach which is to seek out collaborations among internal peers and scale up. Or you can take the Nedergaard approach which is develop the special network, and gain enough public recognition outside of the network that you are capable of leaving it (Fig. 2d). In either case, collaborations among communities and diverse out-degree networks allow faculty to succeed in their given field. Given the wealth of data which has been curated in this fashion, there are numerous explicit questions that can be asked of the data. One of the unique approaches of this data is that is highly reproducible, which allows various questions to be asked. Future work would try to determine what optimal pathways are in a given network to success, and who are ideal collaborators, and collaborations to avoid. Given this information, custom pathways to career success for individual faculty can be developed, moving beyond purely institutional level co-citation networks, which do little to advance faculty development at scale. In Figs 1*c* and *d*, the network increased by 75% in terms of graph density (0.007) and decreased by 18.8% (16) in terms of diameter. What this suggest in that the interconnectivity of the network grew dramatically, while the ability for new members to integrate into it increased. This also apparent when one examines the modularity of the network down by 3.6% (0.857), this suggest that the network has as many communities but these communities are less isolated that those in the previous funding year, meaning fields are becoming more transdisciplinary in their collaborations. This was the result of the presence of a CTSA program, thus demonstrating the effectiveness of such institutions, however, our analysis also lays the framework for applying this to other institutions which may be considering a CTSA. Or maintaining the success of a given CTSA program, and ultimately determining where faculty should place their efforts and choose which programs to pursue career advancement.

2545

Integration of HMIS and UI Health Cerner Clinical System to enable data sharing about homeless individuals

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OBJECTIVES/SPECIFIC AIMS: This research project envisions the integration of Homeless Management Information System (HMIS) and UI Health Cerner electronic medical record (EMR) system with the following goals: (1) enable sharing of data about the status of the housing insecure and homeless. (2) Identify and match patient record accurately. (3) Record housing insecurity or homelessness information with structured data elements in the EMR. METHODS/STUDY POPULATION: We created a Master Person Index (MPI) of

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the homeless individuals from HMSI using OpenEMPI software package, which is an open source implementation of an Enterprise Master Patient Index (EMPI). An entity model was generated based on the selective data elements from HMIS database, which were relevant for the patient identity management and healthcare service management. An automated script was implemented to extract data from HMIS and load it into OpenEMPI to build the MPI. Once the MPI is setup, the Emergency Department users were able to perform patient identity matching and confirm housing insecure or homeless status of their patients by querying the index using the web-based tool. We developed structured data elements to record homelessness information, which will allow us to measure the prevalence of this risk among patients. We are also exploring the possibility to integrate the systems the using the IHE PIX/PDQ profile, which provides ways for healthcare applications to query a patient information server for a patient based on user-defined search criteria, and retrieve a patient's information directly into the application. RESULTS/ANTICIPATED RESULTS: We implemented a MPI of homeless individuals, which would allow the emergency department users to perform patient identity matching of housing insecure or homeless patients, without undue privacy intrusions. We are confident that IHE PIX/PDQ profile is able to support the integration of healthcare and housing and homeless services systems and enable the data sharing in an efficient way. DISCUSSION/SIGNIFICANCE OF IMPACT: The project addressed the gap in the sharing of data about housing insecure or homeless persons between healthcare and housing and social services that will result in improvements in coordination of care, reduce the cycle time from recognition of risk to the referral to housing and services and improve health outcomes and residential stability. Successful completion of this integration project will give us a model that we can scale to many other communities.

CLINICAL EPIDEMIOLOGY

2027

Racial differences in leukemia prognosis: New epidemiologic analysis

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OBJECTIVES/SPECIFIC AIMS: Research on cancer difference is of significant scientific and practical value. For leukemia, the survival disadvantage of the Blacks has been suggested in multiple studies. However, the existing epidemiologic analysis has multiple technical limitations. The goal of this study is to more accurately quantify so as to better understand different sources of racial differences in leukemia survival. METHODS/STUDY POPULATION: A new statistical method, which is based on robust regression and resampling, is developed. Data are obtained from the SEER (Surveillance, Epidemiology, and End Results) database. Using the "classic" epidemiologic methods as well as the new method, analysis is conducted on the prognosis of 4 leukemia subtypes (ALL, CLL, AML, and CML) for 4 major racial groups (White, non-Hispanic White, Black, and Asian and Pacific Islander). RESULTS/ANTICIPATED RESULTS: After effectively removing differences caused by the observed clinicopathological and demographic factors, the survival disadvantage of the Blacks persists for the following patient groups: ALL and age >14, CLL and age >14, and ALL and age ≤ 14. The quantitative results are significantly different from those from classic epidemiologic analysis. Such observed racial differences are more attributable to the unobserved risk factors and cancer disparity. DISCUSSION/SIGNIFICANCE OF IMPACT: This study provides a more effective and more direct quantification of racial difference in leukemia prognosis. The survival disadvantage of the Blacks which is observed for certain subtypes/age groups deserves further attention but should not be overstated. More data collection and analysis are needed to more accurately decipher racial differences in leukemia and other cancer types.

2039

Modifiable risk factors Versus age on developing high predicted cardiovascular disease risk in African Americans

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OBJECTIVES/SPECIFIC AIMS: Clinical guidelines recommend using predicted atherosclerotic cardiovascular disease (ASCVD) risk to inform treatment decisions. The objective was to compare the contribution of changes in modifiable risk factors Versus aging to the development of high 10-year predicted ASCVD risk. METHODS/STUDY POPULATION: Prospective follow-up of the Jackson Heart Study, an exclusively African-American cohort, at visit 1 (2000–2004) and visit 3 (2009–2012). Analyses included 1115 African-American participants without a high 10-year predicted ASCVD risk (<7.5%), hypertension, diabetes, or ASCVD at visit 1. We used the Pooled Cohort equations to calculate the incidence of high (≥7.5%) 10-year predicted ASCVD risk at visit 3. We recalculated the percentage with a high 10-year predicted ASCVD risk at visit 3 assuming each risk factor [age, systolic blood pressure (SBP), antihypertensive medication use, diabetes, smoking, total and high-density lipoprotein cholesterol], one at a time, did not change from visit 1. RESULTS/ANTICIPATED RESULTS: The mean age at visit 1 was 45.2 ± 9.5 years. Overall, 30.9% (95% CI 28.3%–33.4%) of participants developed high 10-year predicted ASCVD risk. Aging accounted for 59.7% (95% CI 54.2%–65.1%) of the development of high 10-year predicted ASCVD risk compared with 32.8% (95% CI 27.0%–38.2%) for increases in SBP or antihypertensive medication initiation and 12.8% (95% CI 9.6%–16.5%) for incident diabetes. Among participants <50 years, the contribution of increases in SBP or antihypertensive medication initiation was similar to aging. DISCUSSION/SIGNIFICANCE OF IMPACT: Increases in SBP and antihypertensive medication initiation are major contributors to the development of high 10-year predicted ASCVD risk in African Americans, particularly among younger adults.

2041

Before hospice: Symptom burden, dementia, and social participation in the final years

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OBJECTIVES/SPECIFIC AIMS: Traditional hospice focuses on symptoms and quality of life (QOL) at the very end of life. Clinical symptoms and QOL in the last 1–2 years of life are also important and may be affected by dementia. Our objective was to characterize how symptoms differ between people with and without dementia in the last years before death and whether symptoms impact social dimensions of QOL. METHODS/STUDY POPULATION: We studied 1270 community-dwelling participants who died between 2011 and 2015 in the National Health and Aging Trends Study, a nationally representative cohort of older adults. From the last interview before death, we examined sensory (vision; hearing), physical (pain; problems with breathing, chewing/swallowing, speaking, upper or lower extremity strength/movement, and balance/coordination), and psychiatric (depression; anxiety; insomnia) symptoms by dementia status. We examined associations between symptoms and participation restrictions (visiting family/friends, attending religious services, participating in clubs/activities, going out for enjoyment, and engaging in favorite activity). RESULTS/ANTICIPATED RESULTS: Low energy (69%), pain (59%), and lower extremity strength/movement problems (56%) were most common. People with dementia (37.3% of decedents) had higher prevalence of all symptoms ($p \leq 0.01$), except pain, breathing problems, and insomnia. Dementia and greater symptom burden were independently associated with greater odds of participation restrictions ($p < 0.05$). Problems speaking were significantly associated with limitations in all activities except for attending religious services. Balance/coordination, energy, and strength/movement problems were associated with limitations in 3 activities. DISCUSSION/SIGNIFICANCE OF IMPACT: Sensory, physical, and psychiatric symptoms are common in the year before death, with greater symptom prevalence in people with dementia. Both dementia and symptoms are associated with restrictions in participation. Older patients may benefit not only from earlier emphasis on palliative care but also programs and assistive devices that accommodate physical impairments.

2091

Evaluating the validity and utility of surrogate endpoints in clinical trials of chronic kidney disease (CKD)

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OBJECTIVES/SPECIFIC AIMS: The objective of this research is to determine under what conditions endpoints based on estimated glomerular filtration rate (eGFR) slope or on relatively small declines in eGFR provide valid and useful surrogate endpoints for pivotal clinical trials in chronic kidney disease (CKD) patients. METHODS/STUDY POPULATION: We consider 2 classes of surrogate endpoints. The first class includes endpoints defined by the average

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rate of change in eGFR during defined portions of the follow-up period of the trial, following initiation of the randomized treatment interventions. The second class includes composite endpoints defined by the time from randomization until the occurrence of a designated decline in eGFR or kidney failure. The true clinical endpoint is considered to be the time from randomization until kidney failure, irrespective of the trajectory in eGFR measurements prior to kidney failure. We apply statistical simulation to determine conditions under which alternative endpoints within the 2 classes are (1) valid surrogate endpoints, in the sense of preserving a low probability of rejecting the null hypothesis of no treatment effect on the surrogate endpoint when there is no treatment effect on the clinical endpoints and are also (2) useful surrogate endpoints, in the sense of providing increased statistical power that allows significant reductions in sample size and/or duration of follow-up. Input parameters for the simulations include (a) characteristics of the joint distribution of the longitudinal eGFR measurements and the time to occurrence of renal failure, (b) characteristics of the short-term and long-term effects of the treatment, and (c) design parameters, including the duration of accrual and follow-up and the spacing of eGFR measurements during the follow-up period. We use joint analyses of 19 treatment comparisons across 13 previous clinical trials of CKD patients to guide the selection of input parameters for the simulations. We apply longitudinal mixed effects models for analysis of endpoints based on eGFR slope, and Cox regression for analyses of the composite time-to-event endpoints. RESULTS/ANTICIPATED RESULTS: We have previously shown that surrogate endpoints defined by eGFR declines of 30% or 40% can provide valid and useful alternative endpoints in CKD clinical trials for interventions that do not produce short-term effects on eGFR which differ from the longer-term effects of the interventions. Other factors influencing the validity and utility of these endpoints include the average baseline eGFR, the mean rate of change in eGFR, and the extent to which the size of the treatment effect depends on the patient's underling rate of eGFR decline. We will extend these results by presenting preliminary results describing conditions under which outcomes based on eGFR slope provide valid and useful alternatives to the clinical endpoint of time until occurrence of kidney failure. DISCUSSION/SIGNIFICANCE OF IMPACT: The statistical simulation strategy described in this research can be used during the design of clinical trials of chronic kidney disease to assist in the selection of endpoints that maximize savings in sample size and duration of follow-up while retaining a low risk of producing a false positive conclusion in the absence of a true effect of the treatment on the time until kidney failure.

2093

Utilization of an ICD-coded electronic health records (EHR) database to characterize the epidemiology of prosopagnosia

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OBJECTIVES/SPECIFIC AIMS: We aim to examine the epidemiological characteristics of prosopagnosia by querying and analyzing a large deidentified clinical data set from 12 New York City-based hospitals and Federally Qualified Health Centers (FQHCs). The PCORI-funded New York City Clinical Data Research Network (NYC-CDRN) contains ~4.5 million deidentified ICD-coded electronic health records (EHRs) with comprehensive longitudinal information on demographics, patient visits, clinical conditions/diagnoses, laboratory and radiology results, medications, and clinical procedures. The NYC-CDRN will be expanded to include other data sources, including insurance claims, social determinant of health, patient reported outcomes, and patient generated data. The central hypothesis was that systematic mining of this database would reveal new epidemiological information about prosopagnosia. We developed a computable phenotype for prosopagnosia, using the International Classification of Diseases version 9 (ICD-9). The computable phenotype consisted of the diagnostic code for the condition under study, prosopagnosia (ICD-9 code 368.16), as well as the codes for known surrogate diagnoses. We expected to identify cases of acquired prosopagnosia, where the condition occurs only after brain damage, due to stroke, trauma, or meningitis for example, and cases of developmental prosopagnosia, where the condition is present from an early age, with no history of brain damage. The goals of this project were to provide new information about the condition's prevalence rate in the New York City area, which could be furthermore translated into wider geographical areas and to yield novel details about its antecedents and comorbid conditions. METHODS/STUDY POPULATION: To determine the presence of the diagnosis of interest, prosopagnosia, and common co-occurring conditions among a New York City-based study population, we investigated a large database in collaboration with the NYC-CDRN. At the time the large database was mined it contained ~4 million ICD-9 coded EHRs. We first created a search paradigm; applicable for screening the database that consists of ICD-9 coded EHRs. We generated a list of ICD-9 codes indicative for the patients' difficulties with the perception of faces (368.16), which indicates the presence of the condition as part of the psychophysical visual disturbances complex, and this code identified 871 patients. Furthermore, we collected codes that indicate the presence of conditions that are known to be surrogate diagnoses of prosopagnosia. ICD-9 codes for surrogate diagnoses included for example, 854.* (coding for personal history of traumatic brain injury, n = 1,409), 434.01, 434.11, and 434.91 (coding for cerebral thrombosis, embolus and artery occlusion unspecified with cerebral infarction, n = 19,409), and 191.2 (coding for malignant neoplasm of the temporal lobe, n = 566). In October 2015, coding was changed to the new ICD-10 coding system. No additional patients were revealed from the data set when the cohort was searched for the presence of corresponding ICD-10 codes, as institutions are currently in transition from ICD-9 to ICD-10. Using this search query with the large database, we extracted novel information about the epidemiological and demographical distribution of prosopagnosia and furthermore, gained new knowledge about commonly associated diseases. The fact that it must be presumed that the majority of diagnoses of prosopagnosia have been made on the basis of patients' self-reports and clinicians' judgments represents a limiting factor in this study. We are currently exploring machine-learning strategies to identify potential false-negative cases among the patients with surrogate diagnoses. RESULTS/ANTICIPATED RESULTS: Investigations and application of our search query revealed a total number of n = 129,549 patients carrying either the diagnosis code for prosopagnosia or the codes for the known surrogate diagnoses. There were 871 patients who carried the ICD-9 code 368.16, indicating the potential presence of prosopagnosia among other visual disturbances. Remaining patients (n = 128,678) carried codes for known surrogate diagnoses, contained in the search query. Statistical analyses revealed elevated odds ratios for men (OR = 1.55, 95% CI: 1.36, 1.77, $p < 0.0001$), and for Black/African Americans Versus White individuals (OR = 2.09, 95% CI: 1.74, 2.51, $p < 0.0001$). DISCUSSION/SIGNIFICANCE OF IMPACT: Currently, the prevalence of prosopagnosia remains unknown. Face blind individuals are struggling to recognize their social contacts by their face only in every day life and are therefore prone to experience reduced quality of life. We searched the large NYC-based clinical database, containing more than 4.5 million deidentified ICD-coded health records, for cases of prosopagnosia to shed light into its prevalence and epidemiological characteristics. We furthermore, mined the database for cases carrying known surrogate diagnoses to explore the magnitude and characteristics of individuals potentially under increased risk. Our efforts address a great healthcare need, as they revealed new epidemiological knowledge of a vulnerable and understudied population. The results of this project reveal new insights into the epidemiological characteristics of prosopagnosia and its surrogate diagnoses, and demonstrate the feasibility of mining large clinical databases to identify rare clinical populations. Our results suggest the need for a more targeted diagnostic assessment of face perception abilities in populations under increased risk.

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Insulin resistance patterns over 25-years of adulthood and nonalcoholic fatty liver disease in middle age: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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OBJECTIVES/SPECIFIC AIMS: Nonalcoholic fatty liver disease (NAFLD) is the most common cause of liver disease in the United States and increases risk for cirrhosis and liver cancer. Identifying modifiable risk factors for NAFLD could allow better targeting of prevention programs. Insulin resistance (IR) plays a significant role in the development and progression of NAFLD. IR is also an important precursor to the development of type 2 diabetes (T2DM). However, the development and duration of IR during young adulthood and its association with NAFLD and T2DM in midlife is unclear. To test whether trajectories of IR using homeostatic model assessment (HOMA-IR) change throughout early adulthood are associated with risk of prevalent NAFLD and T2DM among persons with NAFLD in midlife independent of current or baseline HOMA-IR. METHODS/STUDY POPULATION: Participants from the CARDIA study, a prospective multicenter population-based biracial cohort of adults (baseline age 18–30 years), underwent HOMA-IR measurement (≥8 h fasting and not pregnant) at baseline (1985–1986) and follow-up exam years 7, 10, 15, 20, and 25. At Year 25 (Y25, 2010–2011), liver fat was assessed by noncontrast computed tomography (CT). NAFLD was defined as CT liver attenuation <51

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Hounsfield Units after exclusion of other causes of liver fat (alcohol/hepatitis/medications). Latent mixture modeling was used to identify 25-year trajectories in HOMA-IR over time. Multivariable logistic regression models were used to assess associations between HOMA-IR trajectory groups and prevalent NAFLD with adjustment for baseline or Y25 HOMA-IR. RESULTS/ANTICIPATED RESULTS: Among 3060 participants, we identified 3 distinct trajectory groups for HOMA-IR for individuals free from diabetes in middle adulthood: qualitatively low-stable (46.7% of the cohort), moderate-increasing (42.0%), and high-increasing (11.3%) with a NAFLD prevalence at Y25 of: 8.3%, 33.4%, and 63.5%, respectively (p-trend < 0.0001). After adjustment for confounders (baseline smoking status, alcohol use, body mass index, physical activity score, systolic blood pressure, antihypertensive medication use, and total/HDL cholesterol ratio) and baseline HOMA-IR, increasing HOMA-IR trajectories were associated with greater NAFLD prevalence compared with the low-stable trajectory group [odds ratio (95% CI): 5.8 (4.3–7.9) and 22.3 (14.2–34.9) for moderate and high, respectively]. These associations were attenuated, but remained significant, even after controlling for current Y25 HOMA-IR [OR = 3.6 (2.6–5.0) for moderate and 5.9 (3.4–10.3) for high (referent: low)]. Among participants with NAFLD (n = 511), high-increasing HOMA-IR trajectory was associated with greater prevalent [OR = 6.5 (1.6–25.7)] and incident [OR = 8.7 (2.2–34.4)] T2DM at Y25 independent of confounders and Y25 HOMA-IR (referent: low-stable). DISCUSSION/SIGNIFICANCE OF IMPACT: In this community-based sample of individuals free from diabetes at baseline, an increasing HOMA-IR trajectory through young adulthood was associated with greater NAFLD prevalence in midlife. Knowledge of changes in IR throughout adulthood provides new information on the risk of T2DM among persons with NAFLD in midlife independent of current level of IR. These findings highlight early identification of increasing IR as a potential target for primary prevention of T2DM in the setting of NAFLD.

2115

Post-traumatic stress disorder associated with Hurricane Katrina predicts cardiovascular disease events among elderly adults

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OBJECTIVES/SPECIFIC AIMS: Cardiovascular disease (CVD) is the leading cause of death among US adults and its prevalence is increasing, despite efforts to identify, and address risk factors. Post-traumatic stress disorder (PTSD) has been identified as a potential risk factor for CVD, though the results to date have focused on male veterans with combat-related PTSD. To our knowledge, there are no prospective analyses/reports among older community-dwelling adults following Hurricane Katrina. The purpose of this study was to explore the link between PTSD associated with Hurricane Katrina and incident CVD among elderly adults using data from the Cohort Study of Medication Adherence among Older Adults (CoSMO). METHODS/STUDY POPULATION: PTSD associated with Katrina and incident CVD events were assessed among 2075 hypertensive participants age ≥65 who were enrolled in a managed care organization in southeastern Louisiana. Baseline surveys were conducted between August 2006 and September 2007. Baseline surveys were conducted between August 2006 and September 2007. PTSD was assessed using the civilian PTSD CheckList (PCL-17) and 2 cut-off points, ≥37 and ≥44, for primary and secondary analyses, respectively. Participants were followed through February 2011 for a composite CVD outcome of MI, stroke, CHF, or CVD death. Multivariable logistic regression was performed with 13 covariates identified in bivariate analysis: age, sex, race, marital status, education, hypertension knowledge, comorbidities, number of antihypertensive medication classes, dissatisfaction with healthcare, reduced medications due to cost, number of visits to healthcare provider in last year, depression, and coping. RESULTS/ANTICIPATED RESULTS: Participants were 59.8% female and 30.4% black, with a mean age of 75 years. The prevalence of PTSD using the primary and secondary cut points was 6.1% and 4.2%, respectively. In total, 240 (11.5%) participants had a CVD event during a median 3.8 year follow-up. After multivariable adjustment, the odds ratios and 95% confidence intervals (CI) for CVD event for the primary and secondary analyses were 1.90 (95% CI: 1.17, 3.09) and 3.74 (95% CI: 2.05, 6.81), respectively. DISCUSSION/SIGNIFICANCE OF IMPACT: PTSD was associated with an increased risk of incident CVD events among elderly adults. This finding from a prospective cohort study supports earlier reports suggesting PTSD is an independent risk factor for CVD. To our knowledge, this association has not been previously reported among a cohort of elderly community-dwelling adults. This study included hypertensive, elderly, insured participants living in southeastern Louisiana following Hurricane Katrina and may not be generalizable to all people with PTSD. Strengths of this study include its longitudinal design, the identification of incident CVD, the diversity of the study population with respect to gender, race and CV risk, and reduced confounding due to access to care and insurance status. Future research is needed to confirm this finding in other populations and to assess if efforts to minimize the impact of PTSD following disasters reduce CVD risk and premature CVD events among older adults.

2122

Factors associated with unintended pregnancy in cancer survivors after cancer

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OBJECTIVES/SPECIFIC AIMS: In the United States, it is estimated that approximately half of all pregnancies are unintended. This study examines the prevalence of unintended pregnancy in a cohort of cancer survivors and identifies factors associated with unintended pregnancy after cancer. METHODS/STUDY POPULATION: The FUCHSIA Women's Study is a population-based study of female cancer survivors at a reproductive age of 22–45 years. Cancer survivors diagnosed between the ages of 20 and 35 years and at least 2 years postdiagnosis were recruited in collaboration with the Georgia Cancer Registry. Participants were interviewed about their reproductive histories. The prediagnosis analysis included all women who completed the interview; the postdiagnosis analysis excluded those who had a hysterectomy, bilateral oophorectomy, or tubal ligation by cancer diagnosis. RESULTS/ANTICIPATED RESULTS: Of the 1282 survivors interviewed, 57.5% reported at least 1 pregnancy before cancer diagnosis; of which, 44.5% were unintended. Of the 1088 survivors included in the postdiagnosis analysis, 36.9% reported a post-cancer pregnancy. Among those who had a pregnancy after cancer diagnosis, 38.6% reported at least 1 pregnancy was unintended. Of the 80 breast cancer survivors who had a pregnancy after diagnosis, 52.5% of them were unintended. Predictors of unintended pregnancy in cancer survivors included being younger than 30 years at diagnosis [odds ratio (OR) 2.1; 95% confidence interval (CI) 1.4, 2.9], identifying as Black (OR 1.6, 95% CI 1.1, 2.3, comparison: White), and having resumption of menses after cancer treatment (OR 8.1, 95% CI 2.0, 33.0). Compared with being <4 years from cancer diagnosis, those who were farther from diagnosis at the time of the interview also had increased odds of unintended pregnancy (4–7 years: OR 1.5, 95% CI 0.9, 2.7; 8–10 years: OR 1.3, 95% CI 0.7, 2.4; >10 years: OR 2.7, 95% CI 1.6, 4.7). DISCUSSION/SIGNIFICANCE OF IMPACT: Despite being at higher risk of infertility, cancer survivors may still be at considerable risk of unintended pregnancy. Women with certain types of cancer that are more likely to be hormone responsive, such as some types of breast cancer, may be hesitant to use hormonal birth control and thus be at higher risk of unintended pregnancy. Counseling for cancer survivors should include a discussion of the risk of unintended pregnancy and contraceptive options.

2156

A confounder assessment of patient frailty in the relationship between antidiabetic medication and heart failure

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OBJECTIVES/SPECIFIC AIMS: This study is part of a parent grant evaluating antidiabetic medications and risk for heart failure in an observational cohort of Veterans with type 2 diabetes (T2DM). Confounding by indication remains a concern in many observational studies of medications because difficult to measure confounders such as frailty may influence prescribing of different medications based on patient characteristics. Frailty is a multidimensional syndrome of loss of reserves (energy, physical ability, cognition, health) that gives rise to vulnerability to adverse outcomes. The objective of this study is to determine if frailty is a potential confounder in Veterans with T2DM, that is, independently associated with exposure to a specific antidiabetic medications and hospitalization for decompensated heart failure. METHODS/STUDY POPULATION: We conducted a cross-sectional study of patients with diabetes who were hospitalized within the Veterans Health Administration (VHA) Tennessee Valley Healthcare System from 2002 to 2012. Inclusion criteria were: age 18 years or older, receive regular VHA care (prescription fill or visit at least once every 180 d), a diagnosis of T2DM. A probability sample of HF and non-HF hospitalizations was collected. HF hospitalizations were selected on the basis of meeting either a primary diagnosis code (ICD-9) and/or disease related group (DRG) code for HF. For each hospitalization using a standardized chart abstraction tool, data was abstracted on: antidiabetic medication(s), patient

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frailty status, and reason for hospitalization (HF or non-HF). Antidiabetic medication regimens were categorized as follows: no medication treatment, metformin alone, sulfonylurea alone, insulin alone, insulin and one oral agent, and all other regimens. Patient frailty status was measured using a modified version of the Canadian Health and Aging frailty index (FI), which generates a score (range 0–1) by dividing the number of deficits present by the number of deficits measured. Established categories for FI scores are: non frail ≤0.10, vulnerable 0.10–0.21, frail 0.22–0.45, and very frail >0.45. Patient frailty status at the time of hospitalization was used as a surrogate for patient frailty at the time of prescription of antidiabetic medication; this is a limitation of this approach. Hospitalizations were classified as HF hospitalizations if 2 major or 1 major and 2 minor Framingham criteria were present. FI was compared across antidiabetic medication regimen categories and hospitalization type using analysis of variance (ANOVA) and Student *t*-test, respectively. RESULTS/ANTICIPATED RESULTS: Of the 500 hospitalizations reviewed, 430 patients had confirmed diabetes diagnosis, adequate data to calculate FI scores, and were included in this analysis. Patients were on average 66.9 (10.9) years old; 99% male and 75% were White. Overall, 268 patients (62.3%) were categorized as frail or very frail. The mean FI score was 0.23 (SD 0.07). FI scores were highest in patients receiving insulin alone (mean 0.26) compared with patients receiving metformin alone (mean 0.22), sulfonylurea alone (mean 0.23), or no medication (mean 0.22). The lowest mean frailty score was seen in patients taking all other drug combinations, 0.19. The differences across these patient groups were statistically significant with $p < 0.01$. Further, 75% of patients on insulin alone were frail or very frail compared with 68% on sulfonylurea alone, 58% on metformin alone, and 58% on no medication. Framingham criteria for acute HF were present for 318 of 430 patients (74.0%). FI scores were higher in patients hospitalized for HF compared with non-HF hospitalizations (mean 0.24 vs. 0.21, $p < 0.01$). A higher proportion of patients hospitalized for HF were classified as frail or very frail compared with those hospitalized for non-HF diagnosis (66.4% vs. 50.9%, $p < 0.01$). DISCUSSION/SIGNIFICANCE OF IMPACT: This study demonstrates that certain antidiabetic medications are associated with patient frailty. In addition, those patients admitted for HF have higher FI scores than those admitted for non-HF diagnoses. Further investigation is planned to assess the degree to which frailty is captured by traditional covariates used in observational studies.

2187

Investigation of antimicrobial resistance in Ureaplasma species and Mycoplasma hominis isolates from urine cultures in college-aged females

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OBJECTIVES/SPECIFIC AIMS: Urinary tract infections (UTIs) serve as one of the most common infections affecting women. With rising reports of antibiotic resistance (ABR), which can prolong illness and limit treatment options, the Infectious Disease Society of America recommends using local resistance patterns to shape empirical treatment selection. Although no studies have evaluated ABR in Ureaplasma spp. urinary isolates in college-aged women, regional studies in the Southeast United States have found levels of tetracycline resistance in over 30% of Ureaplasma spp. clinical isolates. Thus, this study aims to determine the antibiogram for 73 Ureaplasma spp. and 10 Mycoplasma hominis isolates collected from women with first-time UTI against a panel of 9 antibiotics, and assess resistant isolates for genetic mechanisms associated with resistance. METHODS/STUDY POPULATION: This study used archival samples and data collected from college-aged women with first-time UTI recruited to participate in a prospective cohort study conducted at a student healthcare facility from 2001 to 2006 in Florida. Ureaplasma spp. and M. hominis isolates cultured from urine samples collected at the initial clinical presentation and for any recurrent UTI were evaluated for susceptibility to a panel of 9 antibiotics (8 for M. hominis) using validated microbroth and agar dilution methods, respectively. Ureaplasma spp. isolates were tested against azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, doxycycline, gentamicin, levofloxacin, and tetracycline. M. hominis isolates underwent the same testing, with the addition of linezolid and exclusion of azithromycin and erythromycin, as M. hominis is intrinsically resistance to 14 and 15-membered macrolides and azilides. PCR and Sanger sequencing were employed to identify molecular mechanisms associated with resistance. RESULTS/ANTICIPATED RESULTS: Of the 73 Ureaplasma spp. isolates, 1 isolate was resistant to levofloxacin (MIC: 4 μg/mL) and 1 to tetracycline (MIC: 8 μg/mL). All M. hominis isolates were sensitive. For the Ureaplasma spp. isolates, MIC90s were highest against gentamicin (32 μg/mL) and lowest against doxycycline (0.25 μg/mL). PCR amplification identified tetM present in the tetracycline resistant isolate, an established gene associated with tetracycline resistance in Ureaplasma spp. A S83W mutation within the quinolone-resistance-determining region (QRDR) of parC was detected in the levofloxacin resistant isolate. DISCUSSION/SIGNIFICANCE OF IMPACT: Overall, antibiotic resistance in this population of college-aged women with first-time UTI was low. A previous study detected a novel S83W substitution in a perinatal Ureaplasma spp. isolate from Japan, and provided in silico evidence that a S83W change would prevent levofloxacin from binding to its target. However, that study was unable to cultivate the isolate. Our study has provided the corresponding phenotypic evidence that a S83W substitution results in quinolone resistance in Ureaplasma spp.

2220

Pharmacogenomic determinants in Caribbean Hispanics of clopidogrel failure in acute coronary syndrome

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OBJECTIVES/SPECIFIC AIMS: The objective of this study is to measure the association of CYP2C19 (*1-*8,*17), ABCB1(C3435T; rs1045642), PON1 (p.Q192R; rs662), and B4GALT2 (c.909 C > T and c.366 G > C) gene polymorphisms in the Caribbean Hispanic population with major adverse cardiovascular events (MACE). METHODS/STUDY POPULATION: Patients of Caribbean Hispanic ethnicity from all geographic regions of the Island of Puerto Rico, male and female, aged >21 will be recruited. Cases will consist of patients receiving a daily clopidogrel dose of 75 mg following acute coronary syndrome (ACS) who experience a MACE within the first year of treatment. Control study patients must have received clopidogrel 75 mg daily for a minimum of 1 year without experiencing MACE. Genomic DNA samples will be genotyped to determine the frequency distribution of major CYP2C19, ABCB1, PON1, and B4GALT2 gene polymorphisms. Observed frequencies will be compared with other reported populations. An association study will be performed between genetic variables and MACE and a multivariable logistic regression model (additive) will be constructed. RESULTS/ANTICIPATED RESULTS: We anticipate finding a significant association between major genetic determinants of clopidogrel response and MACE where cases with MACE will carry higher frequency of CYP2C19, ABCB1, PON1, and B4GALT2. DISCUSSION/SIGNIFICANCE OF IMPACT: As the range of multiloci allelic combinations in admixed Caribbean Hispanics is higher than in other populations due to its unique 500-year history of genomic admixture, a wide spectrum of genetic variances is expected to be present in the study population. Determining the prevalence and effect of CYP2C19, ABCB1, PON1, and B4GALT2 polymorphisms holds the potential to personalize anti-platelet treatment for Caribbean Hispanic patients requiring treatment after ACS.

2232

Acute kidney injury in patients on SGLT-2 inhibitors: A propensity matched analysis

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OBJECTIVES/SPECIFIC AIMS: In June 2016, the FDA cautioned against the use of SGLT-2 inhibitors because of increased risk of acute kidney injury (AKI) after 101 cases of AKI were reported between March 2013 and October 2015. This study seeks to determine risk of AKI associated with SGLT-2 inhibitors in a large cohort of type 2 diabetic patients. METHODS/STUDY POPULATION: Retrospective cohort study including SGLT-2 inhibitor users and nonusers in the Mount Sinai Chronic Kidney Disease Registry between January 2013 and September 2016. SGLT-2 inhibitor users and nonusers were type 2 diabetics with new SGLT-2 inhibitor prescription after January 2013 and an outpatient visit between 2013 and 2015, respectively. Subjects were propensity matched by nearest neighbor method based on demographics, comorbidities, laboratory values, medications, estimated glomerular filtration rate (eGFR), and length of follow-up. The primary end point was AKI (defined by KDIGO laboratory algorithm) occurring during the follow-up period. RESULTS/ANTICIPATED RESULTS: In total, 372 SGLT-2 inhibitor users [mean age 63 years; 205 (55%) men] and 372 [mean age 63; 194 (52%) men] nonusers were included in the primary analysis. Proportions of AKI events defined by KDIGO criteria in users and nonusers were 4.0% and 10.0%, respectively. Adjusted odds ratio for AKI was 1.00 (95% CI, 0.28–2.62). Median peak serum creatinine measurements during AKI events for user and nonuser groups were 1.60 (IQR 1.36–1.78) and 1.88 (IQR 1.55–2.44) ($p = 0.02$), respectively. Sensitivity analyses yielded similar results. DISCUSSION/SIGNIFICANCE OF IMPACT: These findings suggest that there is no evidence of increased odds of AKI in SGLT-2 inhibitor users compared with propensity-matched nonusers with type 2 diabetes.

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Prevalence and management of chronic pain syndromes during pregnancy

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OBJECTIVES/SPECIFIC AIMS: (1) Characterize the prevalence and initial pharmacological management of chronic pain syndromes during pregnancy in a women's mental health program. (2) Describe the severity and qualitative characteristics of chronic pain during pregnancy and the acute postpartum period. (3) Compare obstetrical and neonatal outcomes between pregnant women with and without chronic pain syndromes. METHODS/STUDY POPULATION: A chart review was conducted to identify all pregnant women who presented for an initial evaluation to the Women's Mental Health Program (WMHP) at the University of Arkansas for Medical Sciences from July 2013 to June 2016. We excluded respondents <18 years of age or who did not consent to having their information used for research purposes. Demographic information, past and current medical histories, and medication history were obtained from written and electronic medical records. Chronic pain complaints and medication history are presented as counts and percentages. In an ongoing prospective, longitudinal study of pregnant women with chronic pain, women are enrolled before 20 weeks gestation and followed throughout pregnancy and the first 3 months postpartum. Study visits occur at 4-week intervals; and pain characteristics, analgesic exposures, other medications, and depressive measures are collected. Obstetrical and neonatal outcomes are obtained following delivery. Subjects will be compared based on pain types (ie, neuropathic pain, non-neuropathic pain, and controls) and treatment exposures (eg, +/− opioids). Primary outcome measures include visual analog scale (VAS). Secondary outcome measures include other pain and depression assessments. Data will be analyzed using SAS 9.4. A p-value of < 0.05 was considered statistically significant. RESULTS/ANTICIPATED RESULTS: (1) Chronic pain conditions were reported by 28.2% (44/156) of the initial referrals to the WMHP. (2) 95.5% of respondents with chronic pain were taking at least 1 medication, and 59.5% were taking 2 or more medications. Mean number of medications used were $2.6 \pm 2.1.3$. The most common medications reported were acetaminophen (43.2%), opioids (43.2%), and sedative/hypnotics (36.4%). Non-pharmacological therapy (eg, physical therapy and transcutaneous electrical nerve stimulation) was reported by 20.5% of respondents. (4) We anticipate that measures of pain severity will increase in pregnancy, peak in the third trimester, and decline in the postpartum period. (5) We foresee that the prospective results will confirm the chart review as indicated by a higher rate of medication exposures during pregnancy, including non-analgesic medications in the women with chronic pain syndromes. (6) We expect women with chronic pain syndromes to have a higher rate of obstetrical complications, specifically pre-term delivery and operative delivery. (7) Finally, we anticipate that chronic pain syndromes and management will result in a higher rate of neonatal complications, specifically neonatal intensive care unit admission, neonatal respiratory problems, and small for gestational age infants. DISCUSSION/SIGNIFICANCE OF IMPACT: Chronic pain syndromes are prevalent in more than one-quarter of pregnant women in our study with the majority of women using pharmacological agents to manage their condition. This prevalence is greater or equal to than other common obstetrical conditions, such as gestational diabetes or preterm delivery. The novel prospective data will be germane to the clinical care of pregnant women with chronic pain disorders. Clinical practice will be better informed by our data regarding the potential impact of chronic pain and its management on pregnancy course and perinatal outcomes. These data will provide the initial foundation for the development of treatment guidelines for the management of chronic pain syndromes during the perinatal period.

2280

Preliminary evaluation of postural stability as a cost-effective means of quantitatively and objectively differentiating between autism spectrum disorder, developmental coordination disorder, and typical development

Haylie Miller, Nicoleta Bugnariu, Priscila Caçola and Rita Patterson

OBJECTIVES/SPECIFIC AIMS: Individuals with autism spectrum disorder (ASD) and developmental coordination disorder (DCD) share overlap in their motor symptom profile and underlying neurology (Sumner, Leonard, & Hill, 2016, JADD). DSM-5 guidelines allow these 2 disorders to be independent or co-occurring (APA, 2013), but common clinical practice does not include systematic assessment to determine the presence or absence of co-occurring DCD in children with ASD, or vice versa. Furthermore, in many cases DCD is managed in a nonspecific manner, with schools making accommodations for a child's motor challenges without formally assigning a diagnosis of DCD. Thus, somewhat subjective, qualitative judgments are made by clinicians to classify children as DCD, ASD, or ASD + DCD in the absence of a reliable, valid, quantitative measure to distinguish between these profiles. As a first step toward developing such a measure, researchers must tease apart the nuanced differences in the motor symptoms of these 2 developmental disorders using methods that are scalable to clinical and educational settings. These methods must also be developed with consideration for logistical variables such as cost, clinical utility of data output, and ease-of-use if they are to be transferrable to physicians, school nurses, and other community health workers outside of academic laboratory settings. To that end, we conducted 2 complementary studies: 1 in the lab and 1 in the community. METHODS/STUDY POPULATION: In the community-based study, we used an affordable, user-friendly, portable balance testing system to assess postural stability during quiet standing (feet shoulder-width apart) with eyes open for 30 seconds. Data were generated from a single force plate in the balance platform. Potential participants were screened for other medical and neurological conditions that might impact their postural stability, and those with significant comorbidities were excluded. We tested 15 children with a reported diagnosis of ASD, 8 children with suspected or diagnosed DCD who were enrolled in a motor intervention program, and 30 typically-developing (TD) children with no significant developmental history reported. The ASD group ranged in age from 7 to 20, the DCD group ranged from 7 to 10, and the TD group ranged from 7 to 19. In the lab-based study, we again obtained force plate data during quiet standing (feet shoulder-width apart) with eyes open for 30 seconds, in our system that also included full-body motion capture, virtual reality, and mobile eye tracking. (Data from these additional sources are not discussed in this disseminaton, as our current focus is on identifying a simple, scalable metric that can be used to distinguish ASD from DCD.) We tested 10 children with a diagnosis of ASD that was confirmed by the research team, 10 children with a diagnosis of DCD that was confirmed by the research team, and 5 TD children with no significant developmental history reported. The ASD group ranged in age from 7 to 18, the DCD group ranged from 8 to 12, and the TD group ranged from 9 to 18. RESULTS/ANTICIPATED RESULTS: Primary outcome measures in both studies were related to Center of Pressure (CoP), including CoP sway, CoP velocity, and amount of sway relative to the base of support. Data analysis from both studies is ongoing, but preliminary trends suggest that CoP metrics may effectively differentiate between ASD, DCD, and TD. During quiet standing, individuals with DCD exhibited the greatest postural sway. Individuals with ASD followed, having greater instability than the TD group. Differences were also evident in the velocity profiles of postural sway. DISCUSSION/SIGNIFICANCE OF IMPACT: Preliminary findings suggest that CoP offers a means of differentiating between typical and atypical development specifically with respect to motor symptoms. This simple, quantifiable measure may prove a sensitive and specific means of systematically assessing co-occurrence of ASD and DCD in clinical and educational settings, leading to more accurate diagnostic classification and tailored intervention. Future directions include conducting analyses that account for participant age and developmental stage with respect to motor skills, determining whether trends hold in a larger sample, and using advanced statistical methods to determine whether CoP variables have predictive validity in discriminating between classifications of ASD, DCD, ASD + DCD, and TD. Eye-movement data were also obtained during these tasks, and may further aid in understanding the factors contributing to atypical postural control. These 2 studies also yielded methodological findings, namely that the portable force platform carries the benefit of high ease-of-use, low cost, and portability, but also has important drawbacks. Specifically, it is not capable of registering accurate CoP data for participants who weigh <40 lbs, and the error variance for the load cells is greater than that of most nonportable, higher-end plates like those embedded in our laboratory's platform. As technological advances continue to facilitate development of more portable, higher-resolution systems, these drawbacks may be significantly reduced. Future directions include further assessment of portable, affordable solutions for this type of testing to identify whether higher-resolution options are available, whether this added resolution increases classification accuracy, and how ease-of-use is perceived by clinical and community health workers.

2355

Phenotype and genotype in surviving relatives after sudden death in the young

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OBJECTIVES/SPECIFIC AIMS: Sudden death in the young (SDY) occurs in people between 1 and 40 years of age who do not have a known premortem risk factor for early death. Cardiovascular diseases account for the majority of

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causes of SDY. Sequencing of genes associated with congenital arrhythmia susceptibility and familial cardiomyopathy reveals pathogenic variants in 30% of postmortem cases (often called "molecular autopsy"). However, better data are needed to determine the prevalence of phenotype and genotype abnormalities in surviving relatives. METHODS/STUDY POPULATION: A retrospective cohort study was performed at a tertiary pediatric center including all subjects with a family history of SDY. Cases were identified using ICD-9 codes (798.1 or .9, V17.41, V17.49, V19.8, V61.07), search of cardiology databases, and by recursive identification of all family members of a subject. Phenotype data was independently reviewed by a pediatric cardiologist. Genotype results were available when obtained by the original treating physician. RESULTS/ANTICIPATED RESULTS: Cardiac evaluations were performed in 279 subjects from 175 families, of whom 117 subjects (42%) were first-degree relatives of the proband. Mean age of the subject at time of evaluation was 9 years (SD 5.9). Most probands were over 18 years at the time of SDY: 1–4 years of age (9%); 5–12 (5%); 13–17 (16%); 18–24 (18%); 25–40 (42%). A final diagnosis was determined in 55 families (20%), and a variant in a gene potentially causative of SDY was discovered in 20/55 (36%) of those families. Variants were classified as 50% pathogenic/likely pathogenic, 50% variants of unknown significance. Cardiac testing (ECG, echo, EST, signal averaged ECG, cardiac MRI, or EP study) was abnormal in 124/279 subjects (44%). Among those with abnormal studies, 57/124 (46%) were from a family where a final diagnosis could be determined (LQT 43%, HCM 21%, ARVC 4%, other cardiomyopathy 19%, WPW 5%, CPVT 2%). However, 67/279 of total subjects (24%) had at least 1 abnormal study and a final diagnosis was not determined in the family. DISCUSSION/SIGNIFICANCE OF IMPACT: An abnormal phenotype is common among relatives referred for cardiac evaluation after SDY. While testing identifies a family diagnosis in 20% of families, many patients have abnormal cardiac testing and no clear diagnosis can be made. An improved postmortem protocol for phenotype testing in relatives of a SDY victim and improved postmortem genetic testing may lead to a higher diagnosis rate and improved risk determination in surviving family members.

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Association of medical and psychosocial risk factors with engagement in prenatal home visiting

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OBJECTIVES/SPECIFIC AIMS: The purpose of this study is to understand factors that are associated with identifying which eligible pregnant women in Baltimore City accept a referral for HV services. Taking into account demographic and obstetrical variables, we will examine the extent to which 13 medical and 14 psychosocial risk factors differentiate pregnant women who (1) accepted a HV referral, (2) could not be located, or (3) refused a HV referral. METHODS/STUDY POPULATION: In this observational study, we will use secondary data on 8172 pregnant women collected by Health Care Access Maryland (HCAM) between 2014 and 2016. HCAM is the single point of entry for all pregnant women in Baltimore City into HV. HV eligibility includes being a pregnant woman, residing in Baltimore City, being uninsured or receiving Medicaid, and being identified by a prenatal care provider who completed an assessment profile of the woman's medical and psychosocial risk (prenatal risk assessment). The outcome variable, HV engagement status (ie, accepted referral, could not be located, refused referral), will be based on HCAM discharge codes. Medical risk factors include BMI, hypertension, anemia, asthma, sickle cell, diabetes, vaginal bleeding, genetic risk, sexually transmitted disease, last dental visit >1 year ago, and taking prescription medications. Psychosocial risk factors include current pregnancy unintended; <1 year since last delivery; late entry to prenatal care (>20 wk gestation); mental, physical, or developmental disability; history of abuse or violence within past 6 months; tobacco use; alcohol use; illegal substance use within the past 6 months; resides in home built before 1978; homelessness; lack of social/emotional support; exposure to long-term stress; lack of transportation; and history of depression or mental illness. All risk factor variables are categorical (yes/no). Control variables will include demographics (eg, age, race, ethnicity, marital status, educational level) and OB history (eg, history of preterm labor, history of fetal or infant death). We will conduct descriptive statistics to characterize the sample and look for interrelatedness among the risk factors. Where there is a high level of inter-relatedness we will consider combining or omitting variables to reduce redundancy. We will use multinomial regression to examine which medical and psychological factors are associated with referral category. RESULTS/ANTICIPATED RESULTS: We hypothesize that (a) women with more medical risk factors will be more likely to accept a referral for HV services, (b) women with more psychosocial risk factors will be more likely to refuse HV or not be located, and (c) certain risk factors, such as depression/mental illness, history of abuse/violence, illegal substance use, homelessness, and exposure to long-term stress will be the strongest predictors of not accepting HV referral and/or not being located. DISCUSSION/SIGNIFICANCE OF IMPACT: The translation of effective randomized control trials (RCTs) to successful implementation in community-based programs can be challenging. Community-based programs serving low-income communities typically lack the same resources available to recruit and retain participants in RCTs. And, exclusion criteria applied in RCTs are often not applied in real world implementation which can open program to participants with more complex social and medical characteristics. Findings from this study will inform the translation of evidence-based HV programs into real world settings through an enhanced understanding of the characteristics of women who are not engaged by HV programs. This will inform development of improved outreach methods that may more effectively engage at-risk women for prenatal HV services.

2408

Sleep apnea is associated with increased risk for sudden unexpected death in epilepsy (SUDEP)

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OBJECTIVES/SPECIFIC AIMS: To assess the association between probable OSA and the sudden unexpected death in epilepsy (SUDEP-7) risk profiling index in monitored adult inpatients with epilepsy. METHODS/STUDY POPULATION: We analyzed 49 consecutive adults (>18 years) with refractory epilepsy admitted to our inpatient epilepsy monitoring unit. The SUDEP-7 inventory was performed for all subjects. Probable OSA was identified using overnight oximetry, the Sleep Apnea Sleep Disorder Questionnaire (SA-SDQ), and STOP-BANG inventory. RESULTS/ANTICIPATED RESULTS: Thirty-nine percent of participants screened positive for probable sleep apnea. Patients with high SUDEP-7 scores were more likely to have a positive screen for OSA. DISCUSSION/SIGNIFICANCE OF IMPACT: OSA is an independent risk factor for sudden cardiac death. OSA may be a hitherto unrecognized contributor to sudden death risk in epilepsy. Further studies determining the relationship between OSA, neural circulatory control and SUDEP are warranted.

2435

Accuracies of using Her2 for prognosis of breast cancer recurrence in Life After Cancer Epidemiology (LACE) Study

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OBJECTIVES/SPECIFIC AIMS: The goal of the study is to evaluate the prognostic importance and accuracies of a biomarker, human epidermal receptor 2 (Her2), for breast cancer recurrence in a cohort study, namely Lifetime after Cancer Epidemiology (LACE). We specifically interested in the role that Her2 plays in prognosis of breast tumor recurrence for women after a previously diagnosed and treated breast cancer. METHODS/STUDY POPULATION: The study cohort includes 2267 women enrolled in LACE who had previously diagnosed breast cancer. Patients were enrolled from each of the 2 LACE registries in California and Utah. The main endpoint of the study is the right-censored time to breast cancer recurrence. Patients' enrollments were, on average, 2 years after diagnosis of the first breast cancer. The patients' characteristics at baseline were obtained through self-administered questionnaires. Cox proportional hazard model with time-varying covariates was used to relate the Her2 status (Her2+ and Her2−) to the primary end point (time to breast cancer recurrence). Hazard ratios (HRs) and their 95% confidence interval comparing Her2+ and Her2− arms were estimated. Time-dependent sensitivity and specificity were used to investigate the performance of using Her2 for classifying patients into high and low risk (Her2 + is classified as hi risk and Her− as low risk) of future breast cancer recurrence at time points after baseline. The time-dependent sensitivity was calculated as the proportion of patients being classified as high risk of recurrence who had breast cancer recurrence before a series of pre-specified time points after baseline, and the time-dependent specificity was calculated as the proportion of subjects being classified as low risk of recurrence who did not have breast cancer recurrence at the same time points. RESULTS/ANTICIPATED RESULTS: The average patient follow-up time was 9.8 years, and 18% of the women got positive Her2 test results at baseline. Among 2267 patients in the study cohort, 2031 had records on their Her2 status, among whom 326 (16.1%) patients were Her2+ and 1705 (83.9%) were Her2−. The mean tumor size among the 2031 patient

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was 2.10 ± 1.22 cm. A majority of the patients (78.9%) were White. Over one-half of these patients were neither current nor past smokers. Only 3% of the patient had a baseline stage IIIA or higher. About 49% of the patients underwent a mastectomy. Radiation therapy was used by 63.5% of the patients, and Tamoxifen users accounted for 78% of the study cohort. We found a statistically significant association between Her2 and breast cancer recurrence (HR = 1.33, log-ran p-value = 0.006). However, the HRs of breast cancer recurrence comparing Her2+ and Her2− patients decreased over time. We also investigate the effect of combined Her2, estrogen (ER), and progesterone (PR) on breast cancer recurrence and found that patients with Her2+ /ER+ / PR− had the highest risk of breast cancer recurrence. The hazard of recurrence for this group of patients was 85% higher than patients with Her2− /ER+ / PR+ . We also investigate the prognostic accuracies of Her2 in terms of time-dependent sensitivity and specificity. Using Her2 as the prognostic biomarker resulted in a specificity consistently over 80% from baseline up until 15 years post-baseline. The time-dependent sensitivity of Her2 was above 90% between baseline and 1.5 years. Then, the sensitivity dropped gradually to 40% from 1.5 years to 3 years post-baseline. For prognosis of breast cancer over 3 years from baseline, the sensitivity was between 30% and 40%. DISCUSSION/SIGNIFICANCE OF IMPACT: As a single biomarker and risk factor, Her2 was statistically significantly associated with the recurrence of breast cancer among patients in the LACE cohort. A composite biomarker by combining Her2, ER, and PR status was also significantly associated with the breast cancer recurrence. However, the HRs of breast cancer recurrence comparing Her2+ and Her2− patients decreased over time, implying that the Her2 status had a high impact on early recurrent breast tumors. Single biomarkers, usually, have very limited ability for prognosis of future events. However, we found that using HER2 as a single biomarker can give a relatively larger specificity consistently over 15 years of the study period. The sensitivity of Her2 is high for detecting early breast cancer recurrence. However, after 2.5 years from baseline, using Her2 for breast cancer recurrence detection is not reliable. Due to the relatively high accuracies of using Her2 status for prognosis of breast cancer recurrence, we conclude that Her2 should be considered in clinical studies related to prognosis of breast cancer recurrence. Future studies will investigate if prognostic accuracies can be improved by combining Her2 with baseline clinical risk factors such as age, tumor size and lymph nodes. In conclusion, our study has the clinical impact on prognosis (or early detection) of breast cancer recurrence among women with previously diagnosed and treated breast cancers.

2437

Determinants of depression among women from a large community engagement project

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OBJECTIVES/SPECIFIC AIMS: Depression is one of the leading causes of diseases and disability among women of all ages in the United States. Lack of resources to meet one's daily needs, access to health care, job opportunities, and drug use significantly contribute to depression among women. This paper aimed to explore the determinants of depression among women from a large community-based sample. METHODS/STUDY POPULATION: HealthStreet is a community engagement research initiative at the University of Florida that utilizes the community health worker (CHW) model to assess health concerns and conditions of community members and link them to available social and medical services and health research. From October 2011 through December 2016, CHWs assessed 8469 community members from various locations in the community such as grocery stores, bus stops, health fairs, laundromats, and others. Among these 8469 participants contacted and assessed by the CHWs, 4952 (58.5%) were women. RESULTS/ANTICIPATED RESULTS: Of the total 8469 participants, 4952 were women and 1839 (37.1%) reported ever having depression. Mean age of women who reported depression was 44.1 years (SD ± 14.4). Women who were current users of 3 or more drugs were 10 times more likely (95% CI: 5.73, 18.40; OR 10.27) to report depression compared with those who did not currently use any drugs. Those who were food insecure in the past 12 months (95% CI: 1.970, 2.576; OR 2.253) were twice more likely to report depression, while never married (95% CI: 0.576, 0.771; OR 0.666), and currently unemployed (95% CI: 0.535, 0.715; OR 0.619) women were less likely to report depression. Chronic health conditions such as hypertension (41.6% vs. 33.7%), diabetes (14% vs. 10.5%), and cancer (12.1% vs. 8.3%), and comorbid psychiatric symptoms such as anxiety (54.2% vs. 10.8%) and bipolar disorder (23.8% vs. 2.8%) were significantly higher ($p < 0.001$) among women with depression compared with their counterparts. Significantly more women without a history of depression had medical insurance (68.8% vs. 64.3%) as compared with women with depression. DISCUSSION/SIGNIFICANCE OF IMPACT: Depression was associated with food insecurity and drug use. The impact of drug use continues to be a major mental health concern among community-based women. Further, these findings emphasize the importance of community engagement programs such as HealthStreet, which utilizes the CHWs' model to link community members to social and medical services within the community, in improving the mental health of women.

2440

Among heart failure patients, cannabis use is an independent predictor of hospitalization and discharge against medical advice: Data from the 2012 Nationwide Emergency Department Sample (NEDS)

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OBJECTIVES/SPECIFIC AIMS: To assess the effect of cannabis on impaired judgment and health outcomes among heart failure patients in the emergency room. METHODS/STUDY POPULATION: Patients with heart failure presenting to the emergency room. Cannabis with confounders such as income level, insurance type, tobacco use, and age. Discharged against medical advice to assess impaired judgment. Hospitalization rates, length of stay, and death rate to assess health outcomes. Multivariate logistic regression to access the odds of each of these outcomes from cannabis RESULTS/ANTICIPATED RESULTS: Cannabis is associated with impaired outcome (increase in discharge against medical advice). Cannabis have poorer health outcome in terms of more hospitalizations from the emergency department. Cannabis also have better health outcome in terms of shorter length of stay and death rate among cannabis users Versus nonusers. DISCUSSION/SIGNIFICANCE OF IMPACT: This is crucial to inform health care providers to ensure better counseling of cannabis users. This result should also be considered to interpret other publications that shows better outcomes in patients taking cannabis. Cannabis users might only seem to have a better outcome because they tend to discharge against medical advice and thereby die outside the hospital, etc.

2451

Optimal study design for Diagnostic Accuracy Studies: Differential verification Versus partial verification

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OBJECTIVES/SPECIFIC AIMS: To compare the accuracy and precision for estimating the diagnostic accuracies (sensitivities and specificities) between differential verification (DV) and partial verification (PV) methods. Comparisons were made under scenarios with different values of design parameters including disease prevalence, proportion of verification for positive results, proportion of verification for negative result, sensitivity and specificity of the brass standard (BS) test in DV method. Through comparing 2 different verification methods under different scenarios, we give suggestions that which verification method is optimal under different design settings. METHODS/STUDY POPULATION: For both PV and DV methods, simulation studies were performed using statistical package R, version 3.1.3. We were primarily interested in studying how the unbiasedness and precision for estimation of diagnostic accuracies (sensitivity and specificity) of an index test change with the following design parameters: disease prevalence, proportion of verification for positive test results, the proportion of verification for negative test results, and the sensitivity and specificity of a BS test. We chose different values for each of the above parameters. For each estimation, we allowed values in only 1 parameter to change by fixing the other 2 parameters, so that the effect of each design parameter on the unbiasedness and precision of both sensitivity and specificity can be determined. For the DV method, we also developed an analytical method to estimate the sensitivity and specificity of an index test using a quadratic equation with a unique solution of the specificity and sensitivity. RESULTS/ANTICIPATED RESULTS: For rare disease with prevalence less than 1%, the PV method resulted in a less biased and more precise estimate of sensitivities and specificities of the index test. If the disease prevalence was between 1% and 10%, the DV method using a BS test with moderate or high sensitivity and specificity (sensitivity and specificity >90%) resulted in a less biased and more precise estimate of diagnostic accuracies of the index test. When the disease prevalence was greater than 10%, the PV method was superior when the BS test had sensitivity and specificity <80%, and the DV method was superior when the BS test had both sensitivity and specificity

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>90%. When the proportion of verification of positive test results was <30% or >70%, the DV method yielded smaller bias for the estimated specificity than the PV method. However, the PV method generated a much smaller mean square error (MSE) for specificity than the DV method when the proportion of verification for positive test results was >50%. Although the disease prevalence was >10% and the proportion of verification of positive test results was <30%, the DV method resulted in a smaller MSE for specificity. DISCUSSION/SIGNIFICANCE OF IMPACT: Disease prevalence and proportions of verification for patients with positive and negative test results influence the accuracy of a new diagnostic test. If a new index test for a very rare disease is evaluated, the PV method should be used for assessing the performance of the index test. When a disease prevalence is >1%, the DV method will result in a less biased and more precise estimate of diagnostic accuracy of an index test, if the BS test itself used in the DV method has large specificity and specificity. One concern of using BS test for the DV method is the clinical cost. Depending on the disease type, the BS tests usually are imperfect, but may be less aggressive and/or less expensive than the gold standard test. Moreover, as all clinical examinations require professional personnel to perform, verification of the index test for relative large proportion of a large cohort of patients could become a burden on human resources. Thus, the future research of the optimal design method for a diagnostic accuracy study should be based on the comprehensive cost-effectiveness analysis.

2453

Serious cardiovascular morbidity and mortality in a cohort of adults with Fontan physiology

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OBJECTIVES/SPECIFIC AIMS: The morbidity and mortality in adults with single ventricular hearts who have undergone Fontan palliation is poorly defined. These patients have a high burden of arrhythmia, heart failure, and re-operation. We hypothesized that age and type of Fontan predict occurrence of arrhythmia. METHODS/STUDY POPULATION: In total, 205 patients aged 18 years who had undergone a Fontan procedure were identified. Those with incomplete data were excluded. Demographic, anatomic, pharmacologic, imaging, hemodynamic, and electrophysiologic data were collected. The χ^2 and Mann-Whitney U tests were used to test significance defined as $p < 0.05$. RESULTS/ANTICIPATED RESULTS: Of the 205 patients identified, 59 had been lost to follow-up. Of the 146 patients (77, 53% female) actively followed 18 (12%) had died at a median (IQR) age of 27 (21–34.3); in patients alive as of 10/2016 the median age was 26 years (22–34). Fontan types were lateral tunnel (LT) (n = 79, 54.1%), extracardiac (EC) (n = 32, 22%), right atrial to pulmonary artery (RV-PA) (n = 28, 19%), and Fontan with Bjork modification (n = 4, 2.7%). Systemic left ventricle (n = 96, 66%) was more common than systemic right ventricle (n = 43, 30%). Of the 146 patients, 101 (69%) had significant morbidity or mortality: 86 (59%) were diagnosed with arrhythmia, 18 (12%) died, and 11 (8%) underwent heart transplants. Frequent procedures included: Fontan revisions/cryoablation in 28 (19%), electrophysiology studies with ablation in 73 (50%), and pacemakers in 53 (36%). Of the arrhythmia diagnoses, 57 (64%) were atrial tachyarrhythmias. RV-PA Fontan procedures were associated with significantly more atrial arrhythmia than all other Fontan types (70% vs. 30%; $p < 0.01$). There was no statistical difference in occurrence of atrial arrhythmia in adults with LT Versus EC Fontans ($p = 0.3$). While patients who had undergone RV-PA and Bjork Fontans were older with median age 34 years, there was no significant difference in age between LT and EC (median 24.0 and 24.5). DISCUSSION/SIGNIFICANCE OF IMPACT: Adult survivors of the Fontan procedure suffer from significant morbidity and mortality. The single most prevalent morbidity is atrial arrhythmia. We conclude that RV-PA Fontans, now obsolete, have the highest prevalence of arrhythmia and that there is no difference in arrhythmia burden between LT and EC Fontans. Given the high prevalence of morbidity and mortality in this population, it is imperative that they be followed by cardiologists with expertise in congenital heart disease.

2464

Phenotypic characteristics of pediatric nonalcoholic fatty liver disease

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OBJECTIVES/SPECIFIC AIMS: The purpose of this study is to characterize children with nonalcoholic fatty liver disease (NAFLD) living in the Southeastern United States. METHODS/STUDY POPULATION: This retrospective electronic medical record chart review was conducted on a random sample of 206 children identified with NAFLD. Patients were included if they met the following criteria: confirmed NAFLD through either an ultrasound or liver biopsy or clinical suspicion of fatty liver disease alongside elevated alanine aminotransferase (ALT) in the absence of other etiologies causing elevated transaminases. Patients were excluded if they had hepatitis or other documented liver disease. Data collected at initial presentation included age, gender, ethnicity, height, weight, body mass index (BMI), BMI percentile, blood pressure, HbA1c, aspartate aminotransferase (AST), ALT, γ-glutamyl transferase (GGT), total cholesterol, total triglycerides, low-density lipoprotein, and high-density lipoprotein. Statistical analysis: for descriptive statistics, frequency counts and percentages alongside means, standard deviation, range, min/max values for the continuous variables were calculated. RESULTS/ANTICIPATED RESULTS: This study included 206 children diagnosed with NAFLD. Subjects were primarily male (n = 136, 66%) and Caucasian (n = 133, 66%), followed by Hispanic (n = 42, 21%), Black (n = 25, 12%), and Asian (n = 2, 1%). Mean age at diagnosis was 12.3 ± 3.5 years. Mean weight (lbs), height (in), and BMI (kg/m^2) of subjects at diagnosis were 192 ± 77 lbs, 61.7 ± 6.6 in, 34.6 ± 9.7 kg/m^2, respectively. Patients had an average systolic blood pressure of 124 ± 15.4 mmHg and diastolic blood pressure of 69.6 ± 10.6 mmHg. Mean ALT was 91.8 ± 67.2 U/L, AST was 61 ± 38.8 U/L, and GGT was 55.1 ± 64.6 U/L. Mean HbA1c was 5.8 ± 1.4%, cholesterol was 176 ± 36.3 mg/dL, triglycerides were 200 ± 134 mg/dL, low-density lipoprotein was 107.6 ± 32.1 mg/dL, and high-density lipoprotein was 39.9 ± 8.4 mg/dL. DISCUSSION/SIGNIFICANCE OF IMPACT: In addition to having significantly elevated liver enzymes, children with NAFLD had several derangements in their metabolic profile, most notably high triglyceride levels and HbA1c values in the prediabetic range. Although lifestyle modification is the gold standard treatment for NAFLD, pharmacotherapy may need to be included to address metabolic syndrome.

2472

Subjective cognitive complaints in mild traumatic brain injury and 6-month return to work prediction: A TRACK-TBI Study

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OBJECTIVES/SPECIFIC AIMS: About 75% of the estimated 2.5 million traumatic brain injuries (TBIs) diagnosed annually classify as mild TBI (mTBI); yet cognitive impairments associated with poor patient outcomes can persist for weeks to years. mTBI symptoms are difficult to measure objectively and often remain undiagnosed in the context of an unknown cognitive baseline. Formal neuropsychological exams hold limited utility due to their extensive resource burden. We aimed to define the clinical importance of a 4-question assessment of subjective cognitive complaints (SCC) in predicting return to work at 6 months following mTBI. METHODS/STUDY POPULATION: mTBI participants from the prospective Transforming Research and Clinical Knowledge in Traumatic Brain Injury Pilot Study were included. A self-report affirmation to at least 1 of 4 subjective cognitive symptoms yielded positive SCC. Regression analysis was used to determine factors associated with return to work by 6-months. RESULTS/ANTICIPATED RESULTS: Of 479 enrolled participants with mTBI, 271 (57%) had complete follow-up data. Of which, 156 (58%) had at least sheltered employment at enrollment. Thirty-four (22%) of workers had no return to work at 6-months. Demographics, prior education, presenting injury severity, work status, and post-traumatic stress disorder were associated with return to work. SCC was associated with lower odds of return to work by 6-months (OR = 0.11, $p = 0.01$). DISCUSSION/SIGNIFICANCE OF IMPACT: We suggest a concise 4-question assessment of SCC may be clinically relevant in estimating the likelihood of return to work by 6 months post-mTBI.

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Childhood obesity: A profile of measures of executive functions, emotional processing, and inflammation

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OBJECTIVES/SPECIFIC AIMS: Childhood obesity has become an issue of some concern worldwide. Some reviews and a recent study in adults have indicated that obesity-related inflammatory responses produce brain damage. However, studies exploring associations between inflammation and executive functions in children are overlooked. Therefore, the objective of this cross-sectional study is to determine whether difficulties in executive functions and emotional processing are associated with obesity and inflammation. METHODS/STUDY POPULATION: We have recruited 12 of a total of 60 children aged 6–8 years old. They have completed the NIH Toolbox Cognition Battery and the NEPSY II Affect Recognition tests. Samples of plasma and saliva were collected to quantify inflammatory biomarkers cytokines (IL-6 and TNF-α) assay by Luminex procedure. We performed descriptive analysis and Mann-Whitney *U* test to compare obese Versus nonobese groups. RESULTS/ANTICIPATED RESULTS: Obese children have lower scores in measures of affect recognition than healthy weight children. They also showed higher median scores in both salivary and plasma IL-6 and TNF-α. DISCUSSION/SIGNIFICANCE OF IMPACT: Although no statistical differences were found among groups in either measurement, these preliminary data based on the initial recruitment suggest that children with higher body mass index may have difficulties in emotional processing. More data will be available after completing recruitment to determine if the association between obesity and affect recognition is significant and if it is mediated by inflammation.

CLINICAL TRIAL

2043

Pharmacokinetic prediction of paclitaxel-induced peripheral neuropathy

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OBJECTIVES/SPECIFIC AIMS: Peripheral neuropathy is the dose limiting toxicity of paclitaxel treatment. Paclitaxel pharmacokinetics (PK), specifically the Cmax and amount of time the concentration remains above 0.05 μM (Tc > 0.05), have been associated with occurrence of severe, clinician-documented neuropathy. The objective of this study was to confirm that paclitaxel PK predicts progression of patient-reported neuropathy. METHODS/STUDY POPULATION: This observational trial enrolled breast cancer patients receiving weekly 1-hour paclitaxel infusions (80 mg/m^2 × 12 cycles) at the University of Michigan Comprehensive Cancer Center. Paclitaxel concentration was measured via LC/MS in plasma samples collected at the end of (Cmax) and 16–24 hours after (Tc > 0.05) first infusion. Patient-reported neuropathy was collected (EORTC CIPN20) at baseline and each cycle. The rate of neuropathy severity increase per treatment cycle is being modeled for each patient. Cmax and Tc > 0.05 values will be introduced into the model to confirm that PK independently contributes to neuropathy progression. RESULTS/ANTICIPATED RESULTS: PK and neuropathy data have been collected from 60 patients for ongoing analysis. Our initial model will characterize the expected severity of neuropathy after each cycle of paclitaxel treatment. The PK-neuropathy model will include either PK parameter to validate their contribution to the progression of neuropathy severity during treatment. We anticipate, based on our preliminary analysis of the first 16 patients, that both PK parameters will significantly contribute to the model but Tc > 0.05 will be more strongly associated with neuropathy progression. DISCUSSION/SIGNIFICANCE OF IMPACT: This project will generate a model that can be used to predict a patient's neuropathy severity throughout treatment using a single, conveniently collected and easily measured PK sample during their first cycle. The next steps of this project include identifying genetic and metabolomic biomarkers that predict which patients experienced more severe neuropathy than would be anticipated based on their paclitaxel PK, and a planned interventional trial of personalized paclitaxel dosing to enhance efficacy and/or prevent neuropathy.

2073

Fecal bile acids, fecal short-chain fatty acids and the intestinal microbiota in patients with irritable bowel syndrome (IBS) and control volunteers

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OBJECTIVES/SPECIFIC AIMS: Recent data suggest that fecal microbiota and intraluminal organic acids may play an important role in irritable bowel syndrome (IBS) pathogenesis through effects on intestinal secretion and motility. Understanding their contribution will be critical in developing diagnostic and treatment strategies. Objectives and goals of this study will be to: (1) compare fecal microbiota and fecal organic acids in IBS patients and controls and (2) investigate the association between colonic transit and fecal microbiota in IBS patients and controls. METHODS/STUDY POPULATION: We propose a prospective investigation of fecal organic acids, colonic transit and fecal microbiota in 36 IBS patients and 18 healthy controls. The target population will be adults ages 18–65 years meeting Rome IV criteria for IBS (both diarrhea predominant and constipation-predominant, IBS-D, and IBS-C) and asymptomatic controls. Exclusion criteria are: (a) history of microscopic colitis, inflammatory bowel disease, celiac disease, cancer, chronic infectious disease, immunodeficiency, uncontrolled thyroid disease, liver disease, or elevated AST/ALT > 2.0 x the upper limit of normal, (b) prior radiation therapy of the abdomen or abdominal surgeries with the exception of appendectomy or cholecystectomy > 6 months before study initiation, (c) ingestion of prescription, over the counter, or herbal medications affecting gastrointestinal transit or study interpretation within 6 months of study initiation for controls or within 2 days before study initiation for IBS patients, (d) pregnant females, (e) antibiotic usage within 3 months prior to study participation, (f) prebiotic or probiotic usage within the 2 weeks prior to study initiation, (g) tobacco users. Primary outcomes will be fecal bile acid excretion and profile, short-chain fatty acid (SCFA) excretion and profile, colonic transit, and fecal microbiota. Secondary outcomes will be stool characteristics based on responses to validated bowel diaries. Stool samples will be collected from participants during the last 2 days of a 4-day 100-g fat diet and split into 3 samples for fecal microbiota, SCFA, and bile acid analysis and frozen. Frozen aliquots will be shipped to the Metabolite Profiling Facility at Purdue University and the Mayo Clinic Department of Laboratory Medicine and Pathology for SCFA and bile acid measurements, respectively. Analysis of fecal microbiota will be performed in the research laboratory of Dr. David Nelson in collaboration with bioinformatics expertise affiliated with the Nelson lab. Colonic transit time will be measured with the previously validated method using radio-opaque markers. Generalized linear models will be used as the analysis framework for comparing study endpoints among groups. RESULTS/ANTICIPATED RESULTS: This study seeks to examine the innovative concept that specific microbial signatures are associated with increased fecal excretion of organic acids to provide unique insights on a potential mechanistic link between altered intraluminal organic acids and fecal microbiota. DISCUSSION/SIGNIFICANCE OF IMPACT: Results may lead to development of targets for novel therapies and diagnostic biomarkers for IBS, emphasizing the role of the fecal metabolome.

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Primary management of advanced-stage ovarian cancer: 1 year at a high-volume care center

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OBJECTIVES/SPECIFIC AIMS: To describe the use of primary debulking surgery and neoadjuvant chemotherapy in advanced-stage ovarian cancer patients treated at Memorial Sloan Kettering Cancer Center (MSKCC) over the period of 1 year. Specifically, identify a subset of patients that are medically eligible to be considered for surgery. Examine the ultimate treatment designation for those patients, assessing the application of the MSKCC resectability algorithm and its utility in guiding treatment choice. METHODS/STUDY POPULATION: Using the prospectively maintained Ovarian Cancer Database at MSKCC, we queried patients who presented for initial management of ovarian cancer from July 1, 2015 to June 30, 2016. All patients with stage IIIB-IV disease who received their primary treatment at MSKCC were included in our study. Patients needed to have pathology-confirmed ovarian cancer and all histological subtypes were included. Data were collected and analyzed in Excel. RESULTS/ANTICIPATED RESULTS: There were a total of 173 patients treated for stage IIIB-IVB ovarian cancer at MSKCC during the study period. Of those 98 patients received PDS, whereas 75 were directed to NACT, making MSKCC's overall NACT rate

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43.4% for the year we studied. Of the patients who received NACT, 19 met full Aletti Criteria at diagnosis, precluding them from being considered for surgery. In addition, 21 patients had medical contraindications to surgery, meaning that a total of 40 patients who were given NACT were not able to be considered for PDS. If we then take into account only the patients who were medically eligible for PDS, the rate of NACT at MSKCC drops to 23.1%, almost half of the original value. These medically eligible patients are the population that should be receiving an MSKCC resectability score. Of the 98 patients who underwent PDS, 73.5% had a preoperative resectability score calculated. Based on the algorithm, 81.3% of those patients were deemed to be "low risk" and 15.2% were deemed to be "high risk" of a suboptimal debulking. The algorithm dictates that all "high risk" patients who go on to PDS should undergo a laparoscopy first to assess for resectability and potentially avoid an unnecessary open procedure. Hundered percent of the "high risk" cases that were taken to the OR had an initial laparoscopy before proceeding with PDS. Overall, 93.1% of patients that underwent PDS had an optimal cytoreduction, or ≤1 cm residual disease at the conclusion of surgery. Of the 6 patients throughout the year that had a suboptimal outcome, or >1 cm residual disease, 3 were initially scored as "low risk," 1 was scored as "high risk," and 2 did not receive an MSKCC resectability score prior to their procedure. Of note, 3 of the suboptimal cases had unresectable disease in an anatomical location not accounted for in the resectability algorithm. DISCUSSION/SIGNIFICANCE OF IMPACT: The rates of PDS Versus NACT vary widely between institutions, and it is not always clear how calculations are made. High-volume centers likely see a higher percentage of sicker patients with more advanced disease, which could increase their rates of NACT as many of these patients are not eligible for surgery. It is important to standardize the way our field quotes NACT rates, and to understand how treatment decisions are being made at a given institution. PDS has a demonstrated survival benefit, and while we would ideally use this modality for all of our patients, there will always be a baseline percentage of patients who cannot be considered for the surgery. Since we will never be able to offer those patients PDS, our objective should be to identify patients who can be considered for the procedure and to work toward optimizing their outcomes. In this study we identified the population of patients who are truly the PDS Versus NACT cohort as they were eligible for both modalities. We then examined the application and utility of the MSKCC resectability algorithm in an attempt to further optimize treatment allocation. This scoring system was implemented at our hospital over the past year with the goal that 100% patients going on to PDS would receive a preoperative score. Unfortunately, 26.5% of PDS patients were not scored prior to their procedure. This makes it more difficult to evaluate the efficacy of the scoring system, especially considering 1/3 of the suboptimal cases were not scored. Had these patients received a score, they might have been deemed "high risk" and could have avoided a lengthy operation with a significant chance of a suboptimal outcome. In addition, it is important to note that 3 of the suboptimal PDS outcomes were initially scored as "low risk," and 3 of the suboptimal outcomes were due to disease locations not accounted for in the original resectability algorithm. We will continue logging disease locations of suboptimal cases, it is possible that a certain disease location not in the scoring system is responsible for a significant portion of suboptimal outcomes. The resectability score model had an overall predictive accuracy of 0.756 when it was initially published, and we must continue tracking scores and outcomes to determine its validity when applied prospectively in our population. In order to accurately do so however, an emphasis should be made to ensure 100% of patients being considered for PDS receive a score going forward.

2165

Effects of a novel 2-phase rehabilitation program on postural control in older adults: A pilot study

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OBJECTIVES/SPECIFIC AIMS: Falls are a major source of morbidity and disability in the aging population. Twenty to thirty percent of older adults who fall suffer moderate to severe injuries such as lacerations, hip fractures, and head traumas. A serious component of falling often overlooked is the fear of falling. The fear of falling is part of a debilitating spiral that leads to decreased activity and muscle weakness. The goal of this investigation was to determine if a novel 2-phase rehabilitation program designed to reduce the fear of falling and increase muscle strength could improve postural control during falls in older adults with balance impairments. METHODS/STUDY POPULATION: Four older adults participated in 8 cognitive restructuring workshops entitled A Matter of Balance (AMOB): 2 hours/week, total of 16 hours, designed to restructure thought patterns relative to falls and reduce the fear of falling. Within 1–2 weeks of completion, participants enrolled in Phase II: a standardized 10-week lower-extremity strengthening program. Participants performed high-intensity concentric resistance exercise on a modified seated ergometer (Eccentron, BTE Technologies) twice per week for up to 20 minutes per session. Fear of falling was assessed using the Activities-Specific Balance Confidence (ABC) scale. Postural control was assessed during reproducible falls at 3 phases: baseline (T0), after Phase I AMOB (T1), and after Phase II strengthening (T2). Falls were induced by treadmill perturbations (VGait system, MotekForce Link) occurring at slow and fast belt accelerations. A 3 × 3 ANOVA was conducted on postural control outcomes with phase and stepping cycle as independent factors. Pairwise comparisons were analyzed with the Bonferroni correction. RESULTS/ANTICIPATED RESULTS: Statistically significant main effects were found for phase and stepping cycle ($p = 0.003$, $p = 0.00$). No statistically significant interaction effects were found. However, a trend toward increasing Center of Pressure-Center of Mass (COP-COM) distance occurred after each intervention phase (T1 and T2) during fast treadmill perturbations. The greatest increase in COP-COM distance was found at 100% of the stepping cycle during fast perturbations following 10 weeks of resistance training compared with baseline ($p = 0.006$). No significant differences were found in fear of falling between phases ($p = 0.682$). DISCUSSION/SIGNIFICANCE OF IMPACT: A large COP-COM distance suggests the individual is able to allow straying of the COM outside of the functional base while recovering balance. Meanwhile, a small COP-COM distance represents a conservative approach to postural tasks, in that the performer does not feel stable enough to allow separation of the COP and COM. These pilot data suggest that a 2-phase rehabilitation program can improve specific components of postural control during recovery from falls. Rehabilitation interventions aimed at reducing falls in older adults should consider adding a component of cognitive restructuring in conjunction with standard of care resistance training.

2168

Lower rates of influenza infection following 2 dose series of high-dose vaccination in plasma cell disorders: Results of a randomized, double-blind, placebo-controlled study

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OBJECTIVES/SPECIFIC AIMS: (1) Evaluate safety of a novel influenza vaccination strategy in patients with plasma cell disorders. (2) Measure laboratory-confirmed influenza infection rates following a novel influenza vaccination strategy in patients with plasma cell disorders. (3) Evaluate clinical correlates of response following a novel influenza vaccination strategy in patients with plasma cell disorders. METHODS/STUDY POPULATION: We conducted a double-blind, randomized study over the 2015–16 flu season, comparing 2 doses of Fluzone® High-Dose influenza vaccination (separated by 30 d) to the current standard of care influenza vaccination. Patients were allocated to the experimental arm in 2:1 ratio compared with standard of care arm. Standard of care influenza vaccination was considered single age-based vaccination (standard dose for those <65 y and high dosefor those ≥65 y) and patients in this arm received a saline placebo injection at 30 days to assist in blinding. Eligibility criteria allowed any patient with a PCD and no contra-indication to trivalent inactivated influenza vaccine. The primary endpoint was laboratory-confirmed flu infection rate. Protocol-driven surveillance screened patients for flu-like illnesses and performed laboratory testing for influenza until the end of the flu season in May 2016. Secondary endpoints include HAI titer serologic response rates, clinical correlates of protection from influenza infection, and exploratory studies of cell-mediated immunity through characterization of T cell subpopulations, cytokine profiles, and flu-specific T-cell responsiveness. RESULTS/ANTICIPATED RESULTS: In total, 122 plasma cell disorder patients were enrolled (97 with disease requiring therapy and 25 with asymptomatic gammopathy). Of those 48 patients received a single standard of care influenza vaccination and 74 patients received 2 doses of Fluzone® high-dose vaccine. Median age was 67 years (range 42–90). This 2-dose vaccination strategy was safely tolerated in all patients with no grade 2 adverse events attributed to vaccine. With close clinical follow-up, only 4% of patients receiving 2 vaccine doses developed laboratory confirmed influenza Versus 8.3% of those receiving single vaccine. When compared to the expected CDC influenza infection rate of 10%–15%, 1 sample, 2-tailed binomial testing revealed patients receiving 2 vaccines experienced a significantly lower rate of infection than the expected rate ($p < 0.05$) whereas those receiving single vaccine showed no significant difference ($p = 0.38$). DISCUSSION/SIGNIFICANCE OF IMPACT: This randomized study demonstrates that the 2 dose strategy of Fluzone® high-dose influenza vaccine is safely tolerated in patients with plasma cell disorders and associated with significantly less than expected laboratory-confirmed influenza infections. The results suggest that this novel

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vaccination strategy may have a clinical benefit in reducing influenza infections in plasma cell disorder patients and thus may have practice changing implications. Final analyses of serologic responses, clinical correlates of response, and cell-mediated immune correlates may provide valuable insights into in vivo "immune-competence" in patients with plasma cell disorders.

2198

Gender differences in the pharmacology of buprenorphine sublingual tablets in Hispanics/Latinos: An underrepresented population

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OBJECTIVES/SPECIFIC AIMS: The objective of this study is the pharmacology of sublingual Buprenorphine in Hispanics/Latino men and women. Specifically we plan to: (1) Administer sublingual buprenorphine to Hispanic/Latino men and women volunteers, and measure the circulating amounts of the drug in the bloodstream as a function of time; that is, pharmacokinetics of buprenorphine. The goal of the proposed study is to evidence that there are gender and ethnic differences in the pharmacokinetics of sublingual buprenorphine between not only Hispanics/Latinos and non-Hispanics/Latinos (Caucasian), but also within Hispanic/Latino men and women. METHODS/STUDY POPULATION: We are proposing a phase 1 of buprenorphine using 12 healthy volunteers. To test for differences in pharmacokinetics between Hispanic/Latino men and women, 6 Hispanic/Latino men, and 6 Hispanic/Latino women 21 years of age and older will be recruited. The volunteers should be living in Puerto Rico, and must have both parents born in Puerto Rico. Sublingual buprenorphine will be administered using a low dose of 16 mg one time only. Blood samples will be collected from each volunteer at $t = 0$, 1, 2, 4, 6, 8, 12, and 24 hours after administration. The amount of circulating drug in the bloodstream of the volunteers will be measured using liquid chromatography combined with mass spectrometry. Pharmacokinetic obtained parameters will be maximal plasma concentration, minimal plasma concentration, predose concentration, 24 hour post predose concentration, the time for maximum concentration. The area under the curve will be determined by the trapezoidal rule. Male Versus female data will be compared using 2-tailed *t*-test. RESULTS/ANTICIPATED RESULTS: We anticipate that: (1) Hispanic/Latino women will have longer circulating times of the drug in the bloodstream and higher maximum concentrations, compared with men. (2) Hispanic/Latino men and women will have higher amounts of the circulating drug, compared with already reported pharmacokinetic data of non-Hispanic Caucasian men. DISCUSSION/SIGNIFICANCE OF IMPACT: Gender differences have been elucidated in the prevalence rates of substance abuse, health service utilization, treatment outcomes, and physiological consequences of drug consumption in the United States. It is known that in general, women progress from drug use to dependence must faster than men; women also suffer more severe physical and emotional consequences than men, yet women seek treatment for drug addiction in lower rates compared with men. Women also show lower pharmacological treatment effectiveness as they are less likely to feel satisfied upon entering a substance abuse treatment and they show higher cravings. Sublingual buprenorphine is a very popular and relatively new medication used primarily for opiate addiction since 2002. Gender differences have been elucidated in the pharmacology of buprenorphine sublingual tablets used for the treatment of opioid addiction. One study showed that women had higher concentrations of circulating parent drug and it is metabolites compared with men. One metabolite in particular norbuprenorphine was found in almost double the plasma concentration in women. Interestingly, gender differences were not pursued at all by the Pharmaceutical Company sponsoring the approval of the sublingual Buprenorphine by the FDA. The cytochrome enzyme CYP 3A4 responsible for the metabolism of Buprenorphine has higher activity in Caucasian/African American women compared with men. However these studies failed to design and recruit significant amount of patients with Hispanic ethnicity to adequately elucidate the gender differences within this ethnic group. Higher plasma concentrations and longer circulation times of a drug may result not only in lower efficacy outcomes but also higher toxicity and undesired effects. Unfortunately, the lack of pharmacological effectiveness and lack of satisfaction in women undergoing drug treatment programs has not been adequately studied to understand the gender difference in pharmacological treatment outcomes between Hispanic/Latino men and women. Due to the under-representation of Hispanic/Latino men but most importantly women in s studying the pharmacology of sublingual Buprenorphine, and considering the well-established gender difference of the principal enzyme (CYP 3A4) responsible for the pharmacology of Buprenorphine, we are proposing a pilot study of the pharmacology of sublingual Buprenorphine in Hispanic/Latino volunteers living in Puerto Rico with equal number of male and female patients. We expect our research to clinically and scientifically elucidate the gender differences of sublingual buprenorphine for opioid addiction in Hispanics/Latinos. The outcome of such research will be the foundation of subsequent clinical studies that aim in updating the current standard of care for Hispanic/Latino men and women that require therapy for opioid addiction.

2203

Engraftment and gene expression of an HIV resistant immune system in a Phase I trial of an HIV stem cell gene therapy strategy

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OBJECTIVES/SPECIFIC AIMS: To date, only 1 documented case of an individual cured of HIV has been reported. He received an allogeneic bone marrow transplant with cells harboring an HIV-resistant genotype. To mimic this result, we have initiated a Phase I to evaluate the safety of an autologous stem cell gene therapy bone marrow transplant in HIV-related lymphoma patients. METHODS/STUDY POPULATION: The first cohort of patients will receive a 1:1 ratio of unmanipulated CD34 hematopoietic stem cells (HSC) and lentivector modified CD34 HSC expressing a combination of HIV-resistant genes and a selectable marker for cell sorting prior to transplantation. Safety of the HIV-resistant stem cells will be assessed by evaluating engraftment, expression of the anti-HIV genes, and the stability and sequence of the vector. RESULTS/ANTICIPATED RESULTS: One patient has been enrolled and transplanted with the HIV-resistant stem cells. After 1 and 2 months post-transplant, patient blood samples were received, processed for genomic DNA, analyzed by quantitative PCR (qPCR), and displayed successful engraftment of 16 and 12 vector copies per 100 cells, respectively. Expression of all anti-HIV genes was confirmed by qPCR. PCR on genomic DNA confirmed the correct sizes and sequences of the integrated vector and confirmed the successful engraftment of our gene modified cells. Currently, we are enrolling more patients into the trial. DISCUSSION/SIGNIFICANCE OF IMPACT: If successful, this therapy has the potential to change HIV treatment.

2207

A Phase I dose escalation trial of nab-paclitaxel and fixed dose radiation in patients with unresectable or borderline resectable pancreatic cancer

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OBJECTIVES/SPECIFIC AIMS: Patients with locally advanced pancreatic cancer typically have poor outcomes, with a median survival of ~16 months. Novel methods to improve local control are needed. Nab-paclitaxel (abraxane) has shown efficacy in pancreatic cancer and is FDA approved for metastatic disease in combination with gemcitabine. Nab-paclitaxel is also a promising radiosensitizer based on laboratory studies, but it has never been clinically tested with definitive radiotherapy for locally advanced disease. METHODS/STUDY POPULATION: We performed a phase 1 study using a 3 + 3 dose-escalation strategy to determine the safety and tolerability of dose escalated nab-paclitaxel with fractionated radiotherapy for patients with unresectable or borderline resectable pancreatic cancer. Following induction chemotherapy with 2 cycles of nab-paclitaxel and gemcitabine, patients were treated with weekly nab-paclitaxel and daily radiotherapy to a dose of 52.5 Gy in 25 fractions. Final dose-limiting toxicity (DLT) determination was performed at day 65 after the start of radiotherapy. RESULTS/ANTICIPATED RESULTS: Nine patients received nab-paclitaxel at a dose level of either 100 mg/m^2 ($n = 3$) or 125 mg/m^2 ($n = 6$). One DLT (grade 3 neuropathy) was observed in a patient who received 125 mg/m^2 of nab-paclitaxel. Other grade 3 toxicities included fatigue (11%), anemia (11%), and neutropenia (11%). No grade 4 toxicities were observed. With a median follow-up of 8 months (range 5–28 months), median survival was 19 months and median progression-free survival was 10 months. Following chemoradiation, 3 patients underwent surgical resection, all with negative margins and limited tumor viability. Of the 3 patients, 2 initially had borderline resectable tumors and 1 had an unresectable tumor. Tumor (SMAD-4, Caveolin-1) and peripheral (circulating tumor cells and microvesicles) biomarkers were collected and are being analyzed. DISCUSSION/SIGNIFICANCE OF IMPACT: The combination

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of fractionated radiation and weekly nab-paclitaxel was safe and well tolerated. This regimen represents a potentially promising therapy for patients with unresectable and borderline resectable pancreatic cancer and warrants further investigation.

2224

Characterizing vigilant thoughts and behaviors that disrupt sleep in veterans and utilization of cognitive techniques

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OBJECTIVES/SPECIFIC AIMS: Sleep disturbance is a common problem following military deployment. Insomnia is associated with other adverse psychiatric and medical health outcomes. There are specialized cognitive behavioral therapies that can effectively treat insomnia; however, these tend to emphasize dysfunctional beliefs about sleep rather than nocturnal vigilance. Deployment to a threatening environment can engender nocturnal vigilance, which appears to be a salient feature of sleep disturbance in formerly deployed veterans. The purpose of this analysis is to characterize sleep-interfering thoughts and behaviors observed in an ongoing pilot study of a novel 2-session intervention incorporating various cognitive techniques to improve sleep in veterans. METHODS/STUDY POPULATION: To date, 10 formerly deployed US veterans with disturbed sleep have been recruited from the greater DC area. Participants are assessed at baseline, receive 2 intervention sessions, and are again assessed in 3 months. Sleep-interfering thoughts and behaviors are evaluated via self-report forms including the Fear of Sleep Inventory (FoSI), interviews, and prospective diaries. A portion of both intervention sessions addresses vigilant behaviors and sleep-interfering thoughts by teaching participants 1 of 4 techniques that target nocturnal vigilance: cognitive defusion, body scan, self-guided pleasant imagery, and dream rescripting. RESULTS/ANTICIPATED RESULTS: All of the first 10 participants endorsed sleep-interfering thoughts on the Fear of Sleep Index (FOSI) at a severity level of at least "a few times per month" (rating of ≥ 1), including several regarding previous trauma (#5) and nightmares (#10 and #16). Other elicited thoughts included thoughts about their environment ($n = 6$), sleep ($n = 5$), social or occupational concerns ($n = 8$), nightmares ($n = 5$), and health ($n = 4$). All of the first 10 participants endorsed vigilant behaviors, including being over-attentive to their environment ($n = 7$), checking behaviors ($n = 6$), and being "on-guard" ($n = 8$). Cognitive technique was selected by the participant in collaboration with the facilitator. Customized recommendations were given as to the timing and duration of practice, but all participants were instructed to practice at least once daily. Three participants ($n = 3$) were fully compliant with their cognitive technique recommendations (choosing a body scan or imagery), 5 were partially compliant, and 2 were not compliant (both chose cognitive defusion). There was a significant reduction in sleep onset latency and wake after sleep onset from baseline to post-treatment ($p < 0.05$). DISCUSSION/SIGNIFICANCE OF IMPACT: The preliminary data suggests that veterans exhibit cognitive and behavioral patterns that involve vigilance and interfere with sleep and demonstrates the need for an intervention targeting the link between nocturnal vigilance and sleep disturbance. More veteran participants and feedback are needed to optimize the efficacy and effectiveness of this sleep training.

2263

The effect of family history, alcohol expectancies, and sex differences on hangover symptoms following intravenous alcohol self-administration in nondependent drinkers

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OBJECTIVES/SPECIFIC AIMS: The current study examined hangover following IV alcohol self-administration (IV-ASA) using the Computer-Assisted Infusion System. The goal of the study was to identify predictors of hangover, including drinking history, alcohol sensitivity, family history, expectancies, and sex differences in nondependent drinkers. METHODS/STUDY POPULATION: The study sample included 89 healthy, nondependent drinkers aged 21–45 years. After a screening to exclude any medical illness or psychiatric disorders, participants completed an IV-ASA session. Each session consisted of a 25-minute priming phase, during which participants were prompted to press a button to receive individually standardized alcohol infusions, followed by a 2-hour "open bar" phase, during which they were instructed to recreate a typical drinking experience. Results from the IV-ASA included peak and average BrAC. Drinking patterns were assessed using the Alcohol Use Disorders Identification Test, which provided 3 subscales: consumption (AUDIT-C), dependence (AUDIT-D), and harmful drinking (AUDIT-H). Subjective response to alcohol was measured using the Drug Effects Questionnaire (DEQ). The Alcohol Hangover Scale (AHS) was used to assess hangover for the period between participants' departure from the study unit and 10 AM the next morning. The Alcohol Effects Questionnaire (AEFQ) is a measure which includes 40 true/false statements about how alcohol typically makes respondents feel, and was used to measure alcohol expectancies. RESULTS/ANTICIPATED RESULTS: Results showed that 78% of participants endorsed having at least 1 hangover symptom following IV-ASA. The most commonly reported items were tired, thirsty, headache, and hangover. There was no association between hangover scores and the AUDIT-C or IV-ASA. Because alcohol consumption was not related to hangover symptoms, risky drinking behavior was examined. Results indicated that participants endorsing 4 or more items on the AUDIT-D plus AUDIT-H subscales showed significantly higher average hangover scores. Linear regression analyses indicated that alcohol hangover scores were associated with DEQ items feel, high, and intoxicated. Ongoing analyses are examining additional predictors of hangover including family history, alcohol expectancies, sex differences, and other alcohol sensitivity measures. DISCUSSION/SIGNIFICANCE OF IMPACT: The results indicated that risky drinking patterns and alcohol response measures were positively associated with hangover symptoms in non-dependent drinks, while no correlation between consumption and hangover symptoms were found. Since previous research has shown than greater subjective response is associated with heavy drinking and predictive of alcohol use disorder, it is possible that hangover symptoms is a marker of this relationship. Since the role of hangover in the transition from heavy drinking to disorder still remains unclear, it will be important to characterize this relationship between alcohol sensitivity and hangover as a function of drinking patterns. This understanding may help to prevent this transition from at-risk drinking to alcohol dependent drinking.

2272

Pilot study: Implementing Brief Dialectical Behavior Therapy (DBT-A) group skills training in a public and alternative high school setting

Tamika Zapolski, Matthew C. Aalsma, Michelle Salyers and Dennis Watson

OBJECTIVES/SPECIFIC AIMS: Engagement in risky behaviors is not uncommon among adolescents. Two factors associated with risk taking are difficulty regulating emotions and impulsivity. Moreover, youth who exhibit higher scores on impulsivity-like personality traits (ie, negative urgency, positive urgency, sensation seeking, lack of premeditation, and lack of perseverance) are at even heightened risk. An effective intervention decreasing risk-taking behavior among adolescent populations in clinical settings is Dialectical Behavioral Therapy for Adolescents (DBT-A), which teaches skills on emotion regulation, distress tolerance, and mindfulness. However, DBT-A has yet to be tested as an intervention for youth in a nonclinical setting. The current study aimed to fill this gap in the literature. METHODS/STUDY POPULATION: A 9-week DBT-A skills group was implemented in a public high school classroom (7th-8th graders; $N = 41$) and an alternative high school for at risk youth (7th-12th graders; $n = 21$). Of the 41 youth from the public high school classroom participated, with preintervention and postintervention data provided by 30 participants (retention of 73%). RESULTS/ANTICIPATED RESULTS: Results found a significant increase in mindfulness skills and marginally significant increase in emotion regulation skills. Although there was not an overall change in risky behavior among participants, those who were higher on lack of premeditation and positive urgency showed steeper improvements on the skills. The second study at the alternative high school is currently underway, with no current results to report. DISCUSSION/SIGNIFICANCE OF IMPACT: This study will demonstrate that DBT-A skills training is feasible in a school-based setting and shows promising preliminary evidence of decreasing risk of engagement in risky health behaviors among adolescents, particularly among high-risk youth.

2276

The impact of social influence and impulsivity on IV alcohol self-administration in non-dependent drinkers

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OBJECTIVES/SPECIFIC AIMS: Impulsivity is a significant predictor of alcohol use and drinking behavior, and has been shown to be a critical trait in those with alcohol use disorder. Suggestibility, or susceptibility to social influence, has been

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shown to correlate with impulsivity, with highly suggestible individuals being more likely to make impulsive decisions influenced by peer groups. However, the relationship between social influence and drinking behavior is unclear. Our objective was to describe the relationship between social influence and impulsivity traits using the social delayed discounting task and potential differences in intravenous alcohol self-administration (IV-ASA) behavior. METHODS/STUDY POPULATION: Healthy, non-dependent drinkers (n = 20) completed a CAIS session, which consisted of an initial 25-minute priming phase, where subjects were prompted to push a button to receive individually standardized IV alcohol infusions, followed by a 125-minute phase during which they could push the button for additional infusions. IV-ASA measures included the peak (PEAK) and average (AVG) BrAC and Number of Button Presses (NBP). Participants completed a social delayed discounting task (SDDT), where participants were presented with the choice of a small, sooner (SS) reward or a large, later (LL) reward. Before starting the task, participants chose peers who selected either the impulsive (SI) or non-impulsive choice (S). Intermittently, the peers' choice was not shown (X) or different choices (D) were selected. Participants also completed the MISS, the Barratt Impulsiveness Scale (BIS-11), UPPS-P Impulsive Behavior Scale, and the NEO personality inventory. RESULTS/ANTICIPATED RESULTS: Participants with higher suggestibility scores had greater NBP, AVG, and PEAK BrAC in the early phase of the IV-ASA session. Higher scores on the MISS were also correlated with higher impulsivity scores including the NEO Neuroticism (N-factor) measure, BIS-11, and UPPS-P. Results also showed that the MISS score was inversely correlated with the percent of impulsive choices in the SDDT, but that this was independent of peers' impulsive or nonimpulsive choices. DISCUSSION/SIGNIFICANCE OF IMPACT: These results indicate that non-dependent drinkers that were more susceptible to social influence had heavier drinking patterns, higher IV-ASA, and higher scores on impulsivity measures. In addition, individuals that were more susceptible to social influence made more impulsive choices in general, but those choices were not affected by peer decisions during the task. As such, susceptibility to social influence may be an important determinant of impulsive choices, particularly in relation to alcohol consumption.

2285

Analysis of racial disparity in the whole blood and plasma of healthy volunteers using rotational thromboelastometry

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OBJECTIVES/SPECIFIC AIMS: To explore the racial differences in rotational thromboelastometry findings using whole blood and plasma samples from healthy volunteers. METHODS/STUDY POPULATION: We studied a cohort of patients at Tulane University Hospitals who came into the pre-op clinic to get blood drawn for labs. The cohort included a total of 44 patients who were otherwise healthy adult volunteers with no history of cardiovascular nor thromboembolic events, 30 African Americans and 14 Caucasians. Patients who required lab work for their upcoming surgery were asked to participate in the study by giving a sample of blood collecting in a light blue-top sodium citrate tube. We excluded patients who were currently on any anticoagulation or antiplatelet medications. We also excluded those with current or previous history of cancer, those with known bleeding disorder, and those who were on chronic transfusion protocol, or had received a blood transfusion within the last 21 days. Data collection was carried out after informed consent was obtained; we collected citrated whole-blood (WB) samples. WB samples were processed within 3 hours of phlebotomy. Platelet free plasma, obtained after centrifugation at 2500 cGy of whole blood for 20 minutes, was kept frozen at −70°C. Frozen plasma was thawed at 37°C for 5 minutes before testing. Samples were recalcified with star-tem reagent, and then the in-tem reagent was added. The latter contains an optimized concentration of ellagic acid and partial thromboplastin phospholipid from rabbit brain. Thromboelastometry (ROTEM) parameters including clotting time, clot formation time, alpha angle, maximum clot firmness, and Lysis Index after 30 and 45 minutes were determined. Data was then retrieved from the ROTEM database and put into an Excel sheet to be analyzed. RESULTS/ANTICIPATED RESULTS: Our results showed that the CFT was higher in both the plasma and the WB of Caucasians when compared with African Americans with a difference between means 137.5 ± 233.7 ($p = 0.56$) and 11 ± 7.85 ($p = 0.168$), respectively; while MCF was increased in the WB and plasma of AA with a difference between means of 1.719 ± 1.974 ($p = 0.38$) and 5.37 ± 2.49 ($p = 0.037$), respectively. In other words, the plasma of Caucasians did seem to take longer to reach the maximum firmness (however not statistically significant $p > 0.05$), while the maximum clot firmness was significantly higher in plasma of AA. In summary and compatibly with the previously published data, our results showed significantly increased prothrombotic profile in the plasma of African Americans when compared with Caucasians. DISCUSSION/SIGNIFICANCE OF IMPACT: This reinforces the role of the whole vascular system and the interaction between its different components in the pathophysiology of thromboembolic events. In one case control study, African ethnicity was associated with increased risk of DVT in parallel with significantly increased peak thrombin on thrombin generation when compared with Caucasians. With our preliminary results, we confirm these data using another tool for the assessment of the plasma in addition to comparing WB samples too. More prospective studies, with higher number of subjects evaluating the value of the results in predicting the risk of development of thromboembolic events in different ethnicities, are needed for better understanding of this disease. In addition, thromboelastometry might require adjustment for ethnicity in studies evaluating ethnically diverse populations.

2304

Identifying optimal multiple sclerosis (MS)-specific atrophy markers as primary endpoint for Phase II s in progressive MS

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OBJECTIVES/SPECIFIC AIMS: To identify brain regions with the highest and least variable rate of multiple sclerosis (MS)-specific atrophy using an agnostic approach, and to perform simulation-based sample size calculations for Phase II s using these regions as primary endpoint. METHODS/STUDY POPULATION: In total, 601 subjects (2638 MRI scans) were analyzed; 520 subjects with relapsing forms of MS across the spectrum of disease severity and duration were followed in a single-center prospective cohort study at an academic MS Center between 2005 and 2010 with annual 3 T MRIs and clinical visits for 5 years, including standardized 1 mm^3 3D T1-weighted images (3DT1s; 2483 MRIs). Separately, a convenience sample of 81 healthy controls (HC) was recruited from the same center and scanned longitudinally using the same MRI scanner and protocol (155 MRIs). 3DT1s were processed using FreeSurfer's longitudinal pipeline (software version 5.3). Rates of change in all cortical and subcortical regions (n = 119 brain regions) were estimated in MS patients and HC with linear mixed effects models. An effect size was calculated for each region as the difference in change over time between MS patients and HC divided by the standard error of the difference [$d = \beta$ (MS × time)/SE β(MS × time)]. Regions were ranked according to absolute effect size, and the top regions were chosen for simulation-based sample size calculations to estimate the number of subjects needed to achieve 80% power to detect a slowing of MS atrophy down to normal aging, assuming significance levels of 5% and 10%. Ten percent was included because some have advocated for a more relaxed alpha in Phase II s. RESULTS/ANTICIPATED RESULTS: Four regions (putamen, subcortical grey matter, caudate, and thalamus) yielded the smallest sample sizes. At 80% power, ~50 subjects per arm would be needed with putamen or subcortical grey matter volume, or ~80–85 subjects per arm with caudate or thalamic volume as primary endpoint. For the remaining regions, >140 subjects per arm would be needed. A 20%–30% increase in sample size was observed when $\alpha = 5\%$ was used. DISCUSSION/SIGNIFICANCE OF IMPACT: Using an agnostic approach considering all brain regions and simulation-based sample size calculations specifically designed for longitudinal studies, putaminal, subcortical grey, caudate, and thalamic volumes are sensitive to change over time and yield feasible sample sizes for Phase II studies in MS. Because the effect size estimates incorporate normal aging, these regions represent the most sensitive outcomes for testing therapeutic interventions that target irreversible, MS-specific brain atrophy. The clinical relevance of these regions is our next focus to help inform which of these regions should be favored as primary endpoint.

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Coronary artery calcification on nongated CT scan predicts mortality and acute myocardial infarction after sepsis

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OBJECTIVES/SPECIFIC AIMS: Cardiac complications are common after hospital admission for sepsis, and elevated troponin has been associated with increased all-cause mortality. However, little is known about clinical or imaging factors that predict these cardiac events. Coronary artery calcification (CAC) is an easily identifiable imaging finding, even on nongated CT scans. The goal of this study is to identify if CAC predicts all cause mortality and acute myocardial infarction. METHODS/STUDY POPULATION: This is a single center, nonconcurrent cohort study including 899 patients who were admitted for sepsis and had a detectable TnI level from January 2013 to December 2013.

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Patients with a CT scan of the chest or abdomen done for other clinical indications within 6 months of this admission were reviewed for the presence or absence of CAC. Medical records were individually reviewed for mortality and type I acute myocardial infarctions at 1 year. RESULTS/ANTICIPATED RESULTS: In total, 144 patients (mean age 57 ± 14.8 years, 48% female) were included in the analysis. CAC was seen in 59% of these scans. Compared to those without detectable CAC, the CAC group had similar APACHE score (18 vs. 16.6, $p = 0.259$), peak TnI (3.64 vs. 2.11 mg/dL, $p = 0.363$), aspirin (63% vs. 51%, $p = 0.144$), and β blocker use (90% vs. 85%, $p = 0.357$) and had higher statin use (48% vs. 27%, $p = 0.013$). CAC was associated with increased all-cause mortality (59.5% vs. 38.9%, $p = 0.016$) and type I myocardial infarctions (10.6% vs. 1.7%, $p = 0.039$) compared with those without CAC. DISCUSSION/SIGNIFICANCE OF IMPACT: Coronary artery calcification is often seen when patients present with a noncardiac acute illness, such as sepsis, often making a new diagnosis for these patients. Mortality and acute MI after sepsis can be predicted by coronary calcification, and identify patients who should be targeted for therapy and close follow-up.

2320

HPA axis predictors of cue-induced intravenous alcohol self-administration in non-dependent drinkers

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OBJECTIVES/SPECIFIC AIMS: Alcohol craving, particularly in response to stress and alcohol cues, can lead to relapse in alcohol-dependent individuals. Hypothalamus-pituitary-adrenal (HPA) axis markers such as the cortisol to corticotrophin (CORT:ACTH) ratio have been shown to be a significant predictor of alcohol relapse. Our objective was to evaluate the influence of HPA-axis measures on intravenous alcohol self-administration (IV-ASA) in binge and nonbinge drinkers. METHODS/STUDY POPULATION: Healthy, non-dependent binge drinkers (n = 14) and nonbinge drinkers (n = 11) participated in this study. They underwent 3 personalized imagery sessions, where they heard 5-minute personalized audio scripts designed to trigger stress, alcohol craving, and neutral-relaxation states. Immediately following these cues, participants were given access to alcohol using a novel IV-ASA paradigm for 120 minutes. Serial blood samples were collected for cortisol and ACTH levels. Subjective measures were collected serially using the Subjective Units of Distress Scale (SUDS), Drug Effects Questionnaire (DEQ), and Alcohol Urge Questionnaire (AUQ). Analyses were conducted using linear regression. RESULTS/ANTICIPATED RESULTS: Results showed that peak and average ACTH levels as well as the CORT:ACTH ratio during the early phase of the IV-ASA session following the stress and alcohol cues were significantly higher than the neutral script; this effect was seen primarily in binge drinkers. After script administration, a greater change from baseline for ACTH predicted time to peak BrAC during IV-ASA. Gender and binge group predicted AUQ MAX (peak alcohol craving over the entire study session) and WANT MAX (peak "want more alcohol" scores over the session). There was a significant correlation between IV-ASA and increased ACTH peak and average values in binge drinkers. The DEQ and AUQ measures were positively correlated with ACTH peak and ACTH change from baseline. DISCUSSION/SIGNIFICANCE OF IMPACT: These findings, to our knowledge, are the first demonstration that exposure to both stress and alcohol cues lead to an increase in ACTH during cue-induced IV-ASA, particularly in binge drinkers. These results suggest that changes in HPA-axis reactivity following stress and alcohol may be important determinants of alcohol consumption in non-dependent binge drinkers.

2322

The effects of fecal microbiota transplantation on the gut microbiota in subjects with *Clostridium difficile* infection

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OBJECTIVES/SPECIFIC AIMS: *Clostridium difficile* is the most common cause of infectious antibiotic associated diarrhea. It is often refractory to antimicrobial therapy and fecal microbiota transplantation (FMT) is emerging as a therapeutic option. The objective is to characterize the direct effects of FMT on the gut microbiota. METHODS/STUDY POPULATION: Fecal specimens were obtained from a cohort of 29 subjects with recurrent *C. difficile* infection who received FMTs from 1 of 4 healthy donors as part of a phase 2 trial (Rebiotix). Fecal specimens were collected from the subject before FMT and up to 6 months post FMT. 16S rRNA sequencing and whole-genome shotgun sequencing were used to assess microbial community composition as compared by weighted Unifrac. RESULTS/ANTICIPATED RESULTS: Before treatment, the microbial community of subjects with *C. difficile* infection was highly distinct from the composition of the healthy donors in terms of metabolic profile. Quantification of phylogenetic community distance from donor by weighted Unifrac distance showed a significant decrease within the 1st week (Wilcoxon rank sum, $p < 0.01$). This metric was predictive of both treatment failures and antibiotic resistance gene count (LR = 22.45, $p < 0.0001$). DISCUSSION/SIGNIFICANCE OF IMPACT: We conclude that distance from donor is a useful metric to quantify FMT success and that FMTs are a promising treatment for otherwise untreatable carriage of antibiotic resistance genes and organisms.

2335

Delayed rewarming for neuroprotection in infants following congenital heart surgery: A safety study

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OBJECTIVES/SPECIFIC AIMS: Congenital heart disease (CHD) is the most frequently occurring birth defect in the United States affecting about 40,000 infants born every year. Despite significant advances in postsurgical survival, developmental outcomes remain disproportionately poor. Therapeutic hypothermia has been used for neuroprotection during cardiac surgery since the 1950s. Infants undergoing cardiac surgery are typically cooled to 28–33°C during the operation and then rapidly rewarmed to normothermia following surgery at a rate of 1°C every 3–5 minutes to minimize concerns surrounding the risks associated with prolonged bypass exposure. However, emerging evidence from animal models has shown rapid temperature changes following surgery may diminish or even negate the neuroprotective effect of intraoperative hypothermia. No prospective studies have assessed the safety or impact of alternative approaches to postoperative temperature management on the outcome of infants with CHD undergoing cardiac surgery. Therefore, we conducted a pilot study to examine the safety of a novel application of a temperature-regulating device to slowly rewarm infants with congenital heart disease over the 12 hours following cardiac surgery. METHODS/STUDY POPULATION: From November 2014 to July 2016, infants with CHD requiring surgery with cardiopulmonary bypass before the age of 12 months were prospectively recruited. Infants were randomized in blocks of 3 with 1 allocated to standard of care and 2 to the experimental protocol. Infants assigned to the standard of care were rewarmed in the operating room while on bypass at a rate of 1°C every 3–5 minutes back to a temperature of 37°C. Infants assigned to the experimental intervention, were rewarmed on bypass to 35°C and then over the subsequent 12 hours following surgery, gradually rewarmed using an FDA approved "cooling blanket" to increase temperature by 0.3°C every 2 hours for 6 hours and then by 0.2°C every 2 hours for 6 hours until the goal temperature of 36.5°C was achieved. Frequency of serious, moderate and other adverse events were tracked. Detailed vital sign data was collected hourly for the first 12 hours after surgery and then every 6 hours for the next 36 hours and included temperature, highest and lowest heart rate, highest and lowest systolic blood pressure, and highest and lowest diastolic blood pressure. Presence or absence of abnormal cardiac rhythms was recorded per 24-hour interval. Chest tube output was recorded in cc/kg/8 hours for as long as the chest tube was in place. Laboratory data points included serum creatinine level, serum glucose level, liver function tests (AST and ALT), platelet count, hematocrit level, PTT, INR, fibrinogen, white blood cell count and lactate. Blood samples for biomarkers of brain injury (s100b and NSE) were obtained on all infants at the following 4 intervals; the preoperative setting for baseline, postoperatively after bypass, on postoperative day 1, and on postoperative day 2. For this safety study, the primary outcome measure was a composite outcome of the frequency of serious adverse events as well as the frequency of any adverse events and was compared among treatment groups. Data were analyzed using an intent to treat analysis. The study was approved by the Maine Medical Center Institutional Review Board. RESULTS/ANTICIPATED RESULTS: Seven infants were randomized to the standard of care group and 9 were randomized to the experimental group. There were 2 exclusions after randomization in the standard of care group with 1 death in the operating room and 1 unsuccessful attempt to wean from bypass. The mean temperature upon arrival to the PICU for the experimental infants was 35.2°C (range 34–36°C) and for the standard of care infants was 37.5°C (range 36.9–38.9°C). For the first 8 hours after surgery, infants in the standard of care group had mean temperatures over 37.0°C. There were no significant differences in the

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frequency of serious, moderate, or other adverse events between the standard of care group and experimental group. No infant in either group had need for cardiopulmonary resuscitation or exploratory surgery within 48 hours following surgery nor did any infant experience any clinically appreciated adverse neurological events such as stroke or seizure. No infant in either group experienced clinically significant bradycardia of less than 100 beats per minute or sustained tachycardia of greater than 160 beats per minute. There was a trend toward lower heart rates in the experimental group. Junctional Ectopic tachycardia (JET) occurred in 2 patients in the experimental group and 1 in the standard of care group. The mean highest INR in both groups was 1.4 (range 1.2–1.6). The mean lowest recorded platelet level in the first 48 hours was 128.8 (range 87–160) in the standard of care group and 123.8 (range 49–229) in the experimental group. Infants in the experimental group had lower chest tube output overall than the standard of care infants. The mean days of intubation for standard of care infants was 5 days (range 1–15 days) and for experimental infants the mean was 3.7 days (range 0–16 d). The PICU length of stay was shorter for the experimental infants (6.9 vs. 12 d for standard of care). The total length of stay was also shorter for experimental infants (12.4 vs. 16.4 d for standard of care). Serum biomarkers of brain injury (s100b and Neuron specific enolase) were elevated in the immediate postoperative period for infants in the standard of care group compared with the experimental group but normalized more quickly for standard of care. DISCUSSION/SIGNIFICANCE OF IMPACT: This small pilot study suggests that mild hypothermia following congenital heart surgery in infants under the age of 12 months is safe as there was no increase in the rate of severe, moderate, or other adverse outcomes in infants who received the experimental treatment of delayed rewarming. This study provides evidence for the efficacy of the cooling blanket in regulating the temperature of infants after surgery. Trends toward lower chest tube output, shorter intubation and decreased length of stay are possibly the result of improved hemodynamic stability in the absence of postoperative fever. Future studies will need to assess the effect of mild hypothermia compared with a normothemic control group.

2341

Association of chronic stress with alcohol seeking and health behaviors

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OBJECTIVES/SPECIFIC AIMS: The objective of this analysis was to characterize the impact of stress, both early life and chronic, on intravenous alcohol self-administration (IV-ASA) in healthy non-dependent drinkers using the Computer-Assisted Infusion System (CAIS). Personality measures also have shown to impact drinking behavior, particularly impulsivity. Few studies have assessed the impact of stress and impulsivity on drinking behaviors in a non-dependent population. METHODS/STUDY POPULATION: Healthy non-dependent drinkers (n = 28) completed a CAIS session, where they push a button adlib to self-administer standardized IV alcohol infusions. Participants completed the Cumulative Chronic Stress interview and the Early Life Stress Questionnaire (ELSQ) for stress measures. The Cumulative Chronic Stress interview was broken up into 4 sections: major life events, life traumas, recent life events, and chronic stressors. The number of endorsed events was added up to create 4 separate scores. Subjective response and craving measures were collected serially using the Drug Effects Questionnaire (DEQ) and Alcohol Urge Questionnaire (AUQ). The Impaired Control Scale (ICS) assessed failed control over recent drinking in the past 6 months. Impulsivity was assessed using the NEO personality inventory, which included the N-impulsive sub-facet, as well as the UPPS-P Impulsive Behavior Scale. RESULTS/ANTICIPATED RESULTS: Results showed early life stress events (ELSQ) are related to more chronic stressors in the cumulative chronic stress interview ($p = 0.005$). Participants with higher chronic stress scores showed lower subjective effects, as measured by the DEQ, following the priming exposure ($p = 0.036$) but had more craving for alcohol as measured by the AUQ ($p = 0.009$). A regression analysis showed the number of chronic stressful events predicted ICS failed attempts to control drinking ($p = 0.034$), after covarying for sex. Participants with more chronic stressful events showed more impulsivity on the N-impulsivity measure ($p = 0.034$) and the UPPS-P positive urgency measure ($p = 0.005$). DISCUSSION/SIGNIFICANCE OF IMPACT: Non-dependent drinkers with more early life stress tend to have a higher number of chronic stressful events. More chronically stressful events were associated with feeling less effects of alcohol and higher craving for alcohol. Participants with more chronically stressful events also appear to have more failed attempts at controlling their drinking. Future analysis will assess for mediation and moderation of these factors. Chronically stressful events and impulsive behaviors could serve as important areas for intervention for better treatment outcomes for alcohol use disorders.

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Ventriculo-arterial coupling and left ventricular mechanical work in systolic and diastolic heart failure

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OBJECTIVES/SPECIFIC AIMS: Our goal was to compare the ventriculo-arterial coupling and left ventricular mechanical work of patients with systolic and diastolic heart failure (SHF and DHF). METHODS/STUDY POPULATION: Patients with New York Heart Association Functional Class II-III HF symptoms were included. SHF was defined as left ventricular (LV) ejection fraction < 50% and DHF as >50%. Analysis of the fingertip arterial blood pressure tracing captured with a finger plethysmography cuff according to device-specific algorithms provided brachial artery blood pressure and stroke volume. LV end-systolic volume was measured separately via transthoracic echocardiography. Arterial elastance (Ea), a measure of pulsatile and nonpulsatile LV afterload, was calculated as LV end-systolic pressure (ESP)/end-diastolic volume. End-systolic elastance (Ees), a measure of load-independent LV contractility, was calculated as LV ESP/end-systolic volume. Ventriculo-arterial coupling (VAC) ratio was defined as Ea/Ees. Stroke work (SWI) was calculated as stroke volume index × LV end-systolic pressure × 0.0136 and potential energy index (PEI) as 1/2 × (LV end-systolic volume × LV end-systolic pressure × 0.0136). Total work index (TWI) was the sum of SWI + PEI. RESULTS/ANTICIPATED RESULTS: Patients with SHF (n = 52) and DHF (n = 29) were evaluated. Median (IQR) age was 57 (51–64) years. There were 48 (58%) and 59 (71%) patients were male and African American, respectively. Cardiac index was 2.8 (2.2–3.2) L/minute and 3.0 (2.8–3.3) L/minute in SHF and DHF, respectively ($p = 0.12$). Self-reported activity levels (Duke Activity Status Index, $p = 0.48$) and heart failure symptoms (Minnesota Living with Heart Failure Questionnaire, $p = 0.55$) were not different between SHF and DHF. Ea was significantly lower in DHF compared with SHF patients [1.3 (1.2–1.6) vs. 1.7 (1.4–2.0) mmHg; $p < 0.001$] whereas Ees was higher in DHF vs. SHF [2.8 (2.1–3.1) vs. 0.9 (0.7-1.3) mmHg; $p < 0.001$). VAC was 1.8 (1.3–2.8) in SHF Versus 0.5 (0.4–0.7) in DHF ($p < 0.001$). Compared with SHF, DHF patients had higher SWI [71 (57–83) vs. 48 (39–68) gm × m; $p < 0.001$) and lower PEI [19 (12–26) vs. 44 (36–57) gm × m; $p < 0.001$]. TWI did not differ between SHF and DHF ($p = 0.14$). Work efficiency was higher in DHF than SHF [0.80 (0.74–0.84) vs. 0.53 (0.46–0.64); $p < 0.001$]. DISCUSSION/SIGNIFICANCE OF IMPACT: The results underscore the differences in pathophysiology between SHF and DHF patients with similar symptom burden and exercise capacity. These results highlight the difference in myocardial energy utilization between SHF and DHF.

2390

Cardiac abnormalities drive exercise intolerance in patients with nonslcoholic fatty liver disease

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OBJECTIVES/SPECIFIC AIMS: Nonalcoholic fatty liver disease (NAFLD) affects 1 in 3 Americans and can exist in 2 histological subtypes: simple hepatic steatosis (SHS) and nonalcoholic steatohepatitis (NASH), a clinically aggressive variant. Fatigue is the most common complaint in patients with NAFLD but the etiology of fatigue is unknown. Thus, the goal of this study was to objectively evaluate fatigue via maximal cardiopulmonary exercise testing and identify determinants of exercise intolerance in NAFLD. METHODS/STUDY POPULATION: In total, 14 subjects with histologically confirmed NAFLD were prospectively enrolled. Subjects with cirrhosis or those with known history of heart failure (systolic or diastolic) were excluded. Fatigue was quantified via the Duke Activity Status Index (DASI) questionnaire. A symptom-limited treadmill cardiopulmonary exercise test was performed in all subjects to measure exercise time (ET) and peak oxygen consumption (peak VO_2). Doppler-echocardiography was performed to measure systolic and diastolic function. RESULTS/ANTICIPATED RESULTS: The DASI score and ET was significantly reduced in patients with NASH (n = 10) when compared to those with SHS [40.2 (IQR = 24.2–50.7) vs. 58.2 (IQR = 50.7–58.2), $p = 0.04$]; [9.1 (IQR = 6.4–12.2) vs. 13.1 (IQR = 12.5–13.1) min, $p = 0.02$, respectively] reflecting moderate fatigue and impaired overall exercise capacity. The ET was directly linked to peak VO_2 ($R = +0.79$, $p < 0.001$), VO_2 at anaerobic threshold ($R = +0.73$, $p = 0.003$), and inversely to ventilatory efficiency index ($R = -0.785$, $p = 0.001$) suggesting impaired cardiorespiratory fitness in those with reduced ET. ET was also linked to several parameters of diastolic dysfunction

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including left atrial volume index ($R = -0.798$, $p < 0.001$), and the ratio of early transmitral pulse-wave Doppler flow velocity (E) to early mitral annulus tissue Doppler velocity E' (E/E') ($R = -0.608$, $p = 0.036$), suggesting a role of diastolic dysfunction in patients with NAFLD with exercise intolerance. DISCUSSION/SIGNIFICANCE OF IMPACT: Cardiac abnormalities drive cardiorespiratory fitness and exercise intolerance in patients with NAFLD. These findings are exaggerated in patients with NASH suggesting a link between disease severity in NAFLD, exercise intolerance and diastolic dysfunction.

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Utility of the Modified Barium Swallow Impairment Profile as an outcome measure in oculopharyngeal muscular dystrophy

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OBJECTIVES/SPECIFIC AIMS: Oculopharyngeal muscular dystrophy (OPMD) is a rare, late-onset muscular dystrophy that causes severe swallowing impairment (dysphagia). Although promising therapies are in the pipeline, validated dysphagia outcome measures for use in OPMD trials have not been established. Videofluoroscopic swallow studies (VFSS) are considered the clinical gold standard for dysphagia assessment, yet the optimal objective measure of VFSS in OPMD is not known. Our aim was to investigate the utility of the Modified Barium Swallow Impairment Profile (MBSImP) as an objective measure of VFSS in OPMD patients. METHODS/STUDY POPULATION: This was a single-center, prospective, cross-sectional study. In total, 26 individuals with OPMD underwent VFSS and other measures of dysphagia including 50-mL water swallow time (ST). Validity was assessed by examining correlations with an OPMD Global Severity Score (GSS) and with dysphagia duration. RESULTS/ANTICIPATED RESULTS: The MBSImP demonstrated moderate correlations with GSS (Pearson $r = 0.52$, $p = 0.006$) and ST ($r = 0.39$, $p = 0.049$). The relationship between MBSImP and dysphagia duration appeared nonlinear, and levelled off with long dysphagia duration. In contrast, ST did not correlate significantly with GSS ($r = 0.27$, $p = 0.18$), nor with disease duration ($r = 0.05$, $p = 0.83$). DISCUSSION/SIGNIFICANCE OF IMPACT: Objective measurement of VFSS is a promising outcome measure in OPMD. With long disease duration, the MBSImP may not be sufficiently sensitive to detect disease progression. More sensitive measures for scoring dysphagia severity on VFSS should be explored for application to future s of OPMD.

2431

Characterization of immune cell differences with anti-thymocyte globulin (ATG) and granulocyte colony stimulating factor (GCSF) in both preclinical and clinical models of type 1 diabetes

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OBJECTIVES/SPECIFIC AIMS: Understand the immunomodulatory effects of anti-thymocyte globulin (ATG) and granulocyte colony stimulating factor (G-CSF) on type 1 diabetes patients using samples and in the preclinical model, the nonobese diabetic mouse. METHODS/STUDY POPULATION: Flow cytometry analysis of phase 1 peripheral blood samples treatment of nonobese diabetic mouse with ATG and GCSF and flow cytometry analysis of immune organs (spleen, lymph nodes, blood, bone marrow). RESULTS/ANTICIPATED RESULTS: Changes in both innate and adaptive immune cell subsets including plasmacytoid dendritic cells, naive, memory, effector CD4+ and CD8+ T-cells, and CD4+ T-regulatory cells and CD8+ T-regulatory cells DISCUSSION/SIGNIFICANCE OF IMPACT: Understanding of immune cell targets for immunotherapy in new-onset type 1 diabetes patients.

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A close examination of anti-retroviral drug selection and management in the optima study

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OBJECTIVES/SPECIFIC AIMS: Effective HIV therapeutic options for persons with advanced HIV disease whose regimens have failed multiple times are limited. Current clinical practice utilizes regimens comprised of combinations of anti-retroviral (ARV) drugs. Despite the widespread use of ARV medications, optimization of initial treatment composition and subsequent management remains challenging. The goals of this study are (a) to better understand the ARV treatment structuring using prior clinical and patient information including virtual phenotype data and measures of viral load and CD4 cell count. We evaluated the potential impact of ARV strategies on AIDS-defining events and mortality; (b) to assess and understand differences of treatment composition and management when comparing standard ARV strategy (<5 ARVs) with an intensive ARV strategy (at least 5 ARVs). METHODS/STUDY POPULATION: OPTIMA was a tri-national (United States, Canada, and United Kingdom) randomized open label of alternative ARV treatment strategies for patients with advanced HIV disease (CD4 ≤ 300 cells/mm^3) and evidence of resistance to 3 classes of ARV medications. OPTIMA used a 2 × 2 factorial design where the 2 factors were an ARV-free period Versus not; and standard Versus intensive ARV regimen. In this study, we focus on participants enrolled in OPTIMA at US participating sites and utilize demographic and clinical data including baseline virtual phenotype, ARV-related data (initial assignments and changes with drugs and dosages), follow-up lab data, AIDS-defining events, and vital status. RESULTS/ANTICIPATED RESULTS: Among 278 US-OPTIMA participants, 146 were randomly assigned to the standard ARV strategy and the rest were assigned to the intensive ARV strategy. Although not the sole factor, baseline virtual phenotype was used in selecting ARV medications within each assigned strategy. Participants in the standard arm exhibited better agreement between virtual phenotype results and the individual drugs selected for their regimen compared with participants in the intensive arm. This agreement had an almost statistically significant impact on survival time. No significant difference was detected in the frequency of ARV changes between standard and intensive ARV groups. DISCUSSION/SIGNIFICANCE OF IMPACT: Even though per design, OPTIMA assigned participants to an ARV strategy using a binary factor (standard vs. intensive ARV) and assessed its effect on HIV-related disease at a coarse level, the trial's design and rich database allowed for a closer examination of the ARV drug initial selection and subsequent management. Our findings summarize the patterns and discuss the effects of ARV and their management, on AIDS-defining events and survival. Such findings could provide preliminary, yet important insight, in understanding ARV use practice and could inform the conduct of future HIV treatment trials. Since the trial's randomization was at the ARV strategy level and not the individual ARV drugs, findings cannot be described in terms of causal pathways for specific ARVs.

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Dose-dependent nature of cocaine infusions on cardiovascular hemodynamics

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OBJECTIVES/SPECIFIC AIMS: Cocaine use is a significant health problem in the United States and associated with increased risk of adverse cardiovascular outcomes. Our goal was to evaluate the effects of rapid cocaine infusions on cardiovascular hemodynamics among patients with cocaine abuse disorder. METHODS/STUDY POPULATION: Patients with a history of cocaine abuse but no overt cardiovascular disease received 4 consecutive intravenous infusions of cocaine (0, 10, 20, 40 mg) given in randomized, double-blinded order. The infusion procedure was repeated on 2 consecutive days (4 infusions each day). Following each dose, patients underwent continuous monitoring via fingertip plethysmography for 30 minutes, followed by an additional 30 minutes washout procedure. Patients were surveyed throughout this timeline to record symptoms of cocaine response. Finger tracings were then used to calculate arterial pressure curves and parameters of heart rate, blood pressure, cardiac output, stroke volume, and systemic vascular resistance according to device-specific algorithms. Mean values were calculated over the entire 30 minutes follow-up and peak values were defined as the maximum value sustained over any 60-second interval during the follow-up period. RESULTS/ANTICIPATED RESULTS: Seven patients were enrolled and received cocaine infusions of 2 consecutive days. Cocaine dose was positively associated with mean cardiac output ($R = 0.489$, $p < 0.001$), peak diastolic blood pressure ($R = 0.435$, $p = 0.001$), mean heart rate ($R = 0.401$, $p = 0.003$), peak systolic blood pressure ($R = 0.399$, $p = 0.003$), peak mean arterial pressure ($R = 0.362$, $p = 0.008$), mean systolic blood pressure ($R = 0.399$, $p = 0.003$), + dP/dt ($R = 0.346$, $p = 0.012$), and peak heart rate ($R = 0.334$, $p = 0.015$). Hemodynamic parameters were also predictive of patient-reported symptoms of cocaine response. DISCUSSION/SIGNIFICANCE OF IMPACT: These data confirm the known pharmacologic effect of cocaine to prevent reuptake of neurotransmitters and demonstrate the feasibility of conducting a noninvasive assessment of cardiovascular

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hemodynamics as a measure of responsiveness to cocaine infusions. This procedure also provides a benchmark to evaluate the potential impact of pharmacologic treatments on cocaine-induced hemodynamic changes and patient perceptions of cocaine response.

2491

Parental concerns about child participation in s reflect a need to move beyond traditional notions of trust and race

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OBJECTIVES/SPECIFIC AIMS: The objective of this study was to identify factors influencing parental willingness of adolescent participation in clinical trials. METHODS/STUDY POPULATION: We applied community engaged research principles to conduct a theory-based, cross-sectional study of parental willingness. Parents (N=307) were given a survey from November 2014 to April 2015. Factors influencing parental willingness were identified using binary logistic regression. SPSS version 22.0 was used to perform analyses, and $p<0.05$ was considered statistically significant. RESULTS/ANTICIPATED RESULTS: The most impactful factor on willingness was Advantages of Adolescent Clinical Research ($p = .001$), followed by Disadvantages of Clinical Research ($p = .006$), Knowledge of Adolescent Clinical Trials ($p = 0.029$), and Perceived Health Status of Adolescent ($p = .036$). In further exploring the influence of Perceived Advantages and Perceived Disadvantages, "My child will do something to help others." ($p = .026$) and "My child is too young to participate in a clinical trial." was the only significant Perceived Disadvantage ($p = .001$) were significantly associated with parental willingness. DISCUSSION/SIGNIFICANCE OF IMPACT: Improving parental knowledge and understanding of adolescent clinical trials, the advantages and disadvantages of adolescent participation, and the health status requirements for child participation are important factors to address when influencing parental willingness to allow adolescents to participate in clinical trials. Recruitment strategies that incorporate this information could improve future adolescent participation in clinical trials, ultimately promoting adolescent health and disease prevention.

2544

Dietary polyunsaturated fatty acid consumption is associated with improved body composition in nonalcoholic steatohepatitis patients

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OBJECTIVES/SPECIFIC AIMS: Nonalcoholic steatohepatitis (NASH) is a common cause of chronic liver disease in the United States characterized by fat accumulation, inflammation, and fibrosis. Higher amounts of fat-free mass (FFM) and lower amounts of fat mass (FM) have been associated with better outcomes in several chronic diseases, recently also in NASH. Body composition is highly influenced by diet. However, the role of diet on body composition in patients with NASH is largely unknown. We hypothesized that consumption of polyunsaturated fatty acids (PUFA), healthy fatty acids mainly found in fish, nuts, and some vegetable oils, is associated with improved body composition, specifically greater FFM and lower FM, in NASH patients. METHODS/STUDY POPULATION: In total, 13 patients with histologically confirmed NASH underwent body composition testing via bioelectrical impedance analysis to estimate FFM% (% of body weight), FM% (% of body weight), and FFM/FM ratio. PUFA and saturated fat consumption was determined by standardized 5-pass 24-hour dietary recall. Correlations were computed using the Spearman rank test. RESULTS/ANTICIPATED RESULTS: Median body mass index (BMI) was 35.7 kg/m^2 (32.8–42.7), median age of the sample was 50 years (46.3–57.3), and 73% were female. Median percent of calories from polyunsaturated fat was 6.8% (5.4–9.6). Percent of calories from PUFA was positively and significantly associated with greater FFM% ($R = 0.56$, $p = 0.049$), lower FM% ($R = -0.59$, $p = 0.035$), and greater FFM/FM ratio ($R = 0.58$, $p = 0.037$). Additionally, a higher PUFA to saturated fatty acids ratio was also significantly correlated with greater FFM% ($R = 0.58$, $p = 0.039$), lower FM% ($R = -0.64$, $p = 0.020$), and greater FFM/FM ratio ($R = 0.57$, $p = 0.043$). DISCUSSION/SIGNIFICANCE OF IMPACT: In patients with NASH, the consumption of PUFA is associated with higher FFM and lower FM, which suggests a protective role of these nutrients on body composition. A larger study on patients with NASH is warranted to confirm our findings on PUFA consumption and body composition, as well as to determine whether these effects will improve clinical outcomes.

COMMERCIALIZATION/ENTREPRENEURSHIP/ REGULATORY SCIENCE

2254

iobio: From academic project to commercial enterprise

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OBJECTIVES/SPECIFIC AIMS: The iobio project enables anyone (eg, diagnosticians, MDs, genetic counselors, citizen scientists) to perform useful analysis of genomic data, without a need to rely on bioinformaticians. iobio uses a novel real-time analysis framework, coupled with powerful visualizations delivered in a standard web browser. The project successfully supports free academic/nonprofit users, but occasions exist where it is more applicable for the project to be delivered commercially. Frameshift Genomics is developing commercial applications and functionality, which will exist alongside and in coordination with the academic project. These products will be marketed to large institutions including genome institutes, hospitals, diagnostic labs etc., but also to individual users who do not have access to large compute resources, or bioinformatic analysts, and everything in between. METHODS/STUDY POPULATION: The commercial iobio project under Frameshift Genomics aims to develop applications and features that cannot be successfully supported by an academic model. For example, when analyses are scaled up to processing of extremely large data sets, a commercial product with access to compute resources makes more sense than an academic tool. Bam.iobio is an application that samples data from sequencing alignment files, taking seconds to generate and visualize statistics representative of the entire file. This app is offered for free academically. When analysis involves thousands of such files, however, the commercial application, multibam.iobio, is more suitable. Other examples, including support for licensed third-party software and permitting extensive computation via cloud platforms, can also only be reasonably be supported via commercial software. Finally, development of commercial applications is driving adoption of more rigorous testing platforms, delivering more robust products. A particular strength of the iobio platform is allowing non-bioinformaticians to understand their data, for example providing quality control functionality providing confidence in data sets and the conclusions drawn from them. Such analyses are critical to all users of genomic data, and the iobio platform is ideally suited to provide an intuitive, integrated framework for performing them. RESULTS/ANTICIPATED RESULTS: The iobio project has been readily adopted by many in the community and shows significant promise for democratizing genomic analysis. Work is ongoing, supported by NIH small business grants, to develop commercial applications that will be marketed to analysts and medical professionals from large genome institutes and universities, to individual project users and citizen scientists. DISCUSSION/SIGNIFICANCE OF IMPACT: There are currently a number of iobio tools available academically, and they have been embraced by many in the genomics community. In fact, a number of popular platforms (eg, Galaxy, the International Cancer Genome Consortium (ICGC) data portal, mygene2 at the University of Washington) have incorporated iobio tools into their own platforms. To date, the gene.iobio variant interrogation tool has been used in a number of diagnostic projects, aiding identification of putative causative variants, and the pre-release version of the commercial multibam.iobio tool has been critical in unearthing data quality problems in project level data.

2389

I-Corps at NCATS: Toward entrepreneurial training for clinical and translational investigators and lessons learned in team-based customer and stakeholder discovery

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OBJECTIVES/SPECIFIC AIMS: The goal of this abstract/presentation is to share lessons learned from participation in the NIH SBIR I-Corps Train-The-Trainer Program, discuss our experiences offering programs at our local institutions, and communicate our plans to develop an I-Corps@NCATS program that can be disseminated across the CTSA network. We believe that an I-Corps@NCATS program will enhance the process of scientific translation by taking best practices from NSF I-Corps and adapting the program to meet the needs of biomedical scientists in academic medical centers. By integrating I-Corps@NCATS training, we hypothesize that the clinical and translational investigator base will be better prepared to identify new innovations and to accelerate

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translation through commercialization. METHODS/STUDY POPULATION: The diverse, interdisciplinary team of investigators involved in this project span 9 CTSA Hubs, including UAB, Rockefeller, UC Denver, HMC-Penn State, UMass, UC Davis, Emory/Georgia Tech, Miami and Michigan. This team was funded by NCATS in 2015–2016 to participate in the CTSA I-Corps Train-The-Trainer Program in conjunction with the NIH-SBIR/STTR I-Corps national program. The goals were to observe the curriculum, interact with and learn from the NSF National Teaching Team and begin implementation of similar programs at our home institutions. Our I-Corps@NCATS team has been holding monthly, and more recently weekly, conference calls to discuss our experiences implementing local programs and to develop a strategy for expanding CTSA offerings that include innovation and entrepreneurship. Our experience revealed several challenges with the existing NSF/NIH I-Corps program offerings: (1) there is no standard curriculum tailored to academic clinical and translational research and biomedical innovations in the life sciences, and (2) the training process to certify instructors in the I-Corps methodology is a much more rigorous and structured process than just observing an I-Corps program (eg, requires mentored training with a national NSF I-Corps trainer). Our team is proposing to address these gaps by taking best practices from NSF I-Corps and adapting the program to create the I-Corps@NCATS Program, tailored to meet the needs of researchers and clinicians in academic medical centers. RESULTS/ANTICIPATED RESULTS: There are 3 primary anticipated results of our project. First, develop a uniform curriculum for the I-Corps@NCATS Program using the National Teaching Team of experts from the NIH's SBIR I-Corps program. Second, build the I-Corps@NCATS network capacity through a regional Train-The-Trainer Program. Third, develop a set of common metrics to evaluate the effectiveness and impact of the I-Corps@NCATS Program across the community of CTSA Hubs and their respective collaborative networks. DISCUSSION/SIGNIFICANCE OF IMPACT: Over the past 10 years, CTSA Hubs have accelerated science by creating/supporting programs that provide research infrastructure, informatics, pilot funding, education/training, and research navigator services to investigators. These investments help to ensure that we are "doing science right" using the best practices in clinical research. Even so, it is equally important to make investments to ensure that we are "doing the right science." Are our investigators tackling research problems that our stakeholders, patients, and communities want and need, to make sure that our investments in science have real-world impact? In order to accelerate discoveries toward better health, scientists need to have a better way to understand the needs, wants and desires of the people for whom their research will serve, and how to overcome key obstacles along the path of innovation and commercialization. To fill this gap, we propose that the CTSA Hubs should include in their portfolio of activities a hands-on, lean startup program tailored after the highly successful NSF Innovation Corps (I-Corps) program. We hypothesize that by adapting the NSF I-Corps program to create an I-Corps@NCATS program tailored to medical research, we will better prepare our scientists and engineers to extend their focus beyond the laboratory and broaden the impact of their research. Investigators trained through I-Corps@NCATS are expected to be able to produce more innovative ideas, take a more informed perspective about how to evaluate the clinical and commercial impact of an idea, and quickly prototype and test new solutions in clinical settings.

2409

Opportunities and challenges for precision medicine and biomarkers: A regulatory science case study

Steven Murdy, Scott J. Steele and Joan E. Adamo

OBJECTIVES/SPECIFIC AIMS: To develop a regulatory science case study as an educational resource to inform the regulatory science considerations in medical product development for a range of scientific priority areas and emerging technologies. METHODS/STUDY POPULATION: Precision medicine represents one of the major regulatory science priority areas and the use of biomarkers holds promise for predicting the response to individual treatment strategies. Although progress has been made toward developing biomarkers, the development and validation of clinically useful biomarkers has presented significant regulatory science challenges, including the utilization of biomarkers in predicting responses to different cancer therapies. This case study reviews the technical, regulatory, and policy issues related to the development and use of lung cancer drugs Opdivo® and Keytruda® and an understanding of the codevelopment and utilization of their associated biomarkers. RESULTS/ANTICIPATED RESULTS: A detailed instructor guide with extensive resources such as diagrams and timelines will accompany the case study and will be used to highlight the development and approval process of 2 competing drugs and their associated biomarkers. The resources will provide a better understanding of their progression through the FDA regulatory process and opportunities and challenges for their use. DISCUSSION/SIGNIFICANCE OF IMPACT: Building on the case study framework we have developed, the detailed timelines and a collection of available resources, an extensive and modular case study will be finalized and made available to academic institutions, industry, regulatory agencies, and the public. The full case study and links to a series of resources will be disseminated as a standalone resource for integration into courses or programs interested in learning about specific regulatory science needs and opportunities to enhance medical product development and approval.

DIGITAL HEALTH & SOCIAL MEDIA

2066

Television viewing: Associations with eating behavior and cravings in healthy, non-obese young adults

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OBJECTIVES/SPECIFIC AIMS: The majority of obese adults do not become obese until adulthood. Although adults spend the equivalent of a 40-hour work week in front of the television (TV), there are mixed data on whether the sedentary behavior of TV viewing is linked with weight gain during adulthood. The purpose of this study was to examine the associations among sedentary behavior, measured as TV viewing and TV in the bedroom, with eating behavior, eating attitudes and cravings, fat gain, and blood pressure in healthy young adults over a 2-year period. METHODS/STUDY POPULATION: The sample included 73 healthy, nonobese adults (56% women, 80% white) who were 26.8 ± 4.5 years of age with a body mass index of 22.9 ± 2.4 kg/m^2. Participants completed clinic visits at baseline and 2-years later (Year 2) which assessed weight, height, blood pressure, waist circumference, and total body fat measured by dual energy X-ray absorptiometry. A food frequency questionnaire was used to estimate dietary intake, and the eating inventory was used to assess dietary restraint, disinhibition, and hunger. At baseline, participants self-reported TV habits including number of hours/week of watching TV (including cable, VCR, DVD) and presence of a TV in the bedroom. For the analysis, participants were stratified by quartiles of TV viewing time. *T* tests were used to examine the association between TV viewing and bedroom TV. Linear regression models were used to examine the association between TV viewing and each anthropometric and body composition measure and change over the 2-year period, as well as with the dietary constructs. Models controlled for age, sex, and baseline body fat. Separate models were used to investigate the associations between bedroom TV and the same dependent variables. RESULTS/ANTICIPATED RESULTS: Participants reported an average of 13.3 ± 10.8 hours/week of TV viewing, with 33.3% reporting a TV in the bedroom. There were no differences in age, sex, or race among the quartiles of TV viewing or between those who did and did not have a bedroom TV. Adults with a bedroom TV did not differ in hours/week of TV viewing compared with those without a bedroom TV. Amount of TV viewing was associated with higher systolic blood pressure at baseline ($p = 0.05$) but with no other anthropometric or body composition indices nor with change in body composition over the 2-year period. Adults with a bedroom TV reported higher craving for sweets at baseline ($p = 0.03$). Amount of TV viewing was related to lower consumption of vegetables ($p = 0.04$) and fruit or fruit juice ($p = 0.03$) at Year 2, but there was no association with total calorie consumption. TV viewing and bedroom TV were not related to dietary restraint, disinhibition, or hunger at either time point. DISCUSSION/SIGNIFICANCE OF IMPACT: Adults who watched more TV consumed fewer fruits and vegetables, and those with a TV in the bedroom reported higher craving for sweets. Though there were no observed relationships between TV habits and body composition change, the associations with cravings and food consumption warrant further exploration. Querying young adults' TV and media use habits in clinical settings may alert physicians to those at risk of developing poor dietary habits.

2083

What factors explain failure to meet clinical recommendations for preschool children's screen-time?

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OBJECTIVES/SPECIFIC AIMS: The American Academy of Pediatrics (AAP) recommends that preschool-aged children spend no more than 2 hours/day

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using digital screens such as TVs. However, there is a proliferation of digital screens in children's daily lives both at school and at home. The purpose of this study was to examine factors that contribute to children's screen-time, including their demographic characteristics and whether or not they have screen-time at school. METHODS/STUDY POPULATION: In total, 59 children (3.3 ± 0.4 years of age; 47% female) enrolled in 3 child care centers participated. Center directors reported school screen-time; 1 center was classified as not providing screen-time and 2 centers were classified as providing screen-time. Parents reported child's age, sex, and maternal education as a proxy for socio-economic status. Parents reported child's out-of-school screen-time by responding to the question "During the past 30 days, on average how many hours per day did your child sit and watch TV or videos outside of school?" Additional questions queried how many hours per day did the child "use a computer or play computer games," "play video games," "use a smartphone," and "use an iPad or tablet." Children's height and weight were collected using standard clinic procedures and body mass index (BMI) was calculated. *T* tests were used to examine differences in screen-time by age, sex, and school screen-time. General linear models were used to examine the influence of school screen-time (1 = no screen-time, 0 = between 1 and 60 min/day of screen-time), age, BMI, and maternal education on out-of-school screen-time and time spent with each device. Logistic regression analysis was used to examine likelihood of meeting screen-time recommendations based on the same characteristics. RESULTS/ANTICIPATED RESULTS: Parent-reported total screen-time was 6.3 ± 3.6 hours/day (h/d); specifically, 2.5 ± 1.1 h/d watching TV, 1.5 ± 2.2 h/d using a smartphone, 1.1 ± 0.9 h/d using a tablet, 0.8 ± 1.0 h/d on a computer, and 0.5 ± 0.7 h/d playing video games. Based on total screen-time, 15% of children met AAP recommendations; based on TV viewing only, 52% met AAP recommendations. The 4-year-old children viewed more screen-time overall compared to the 3-year-old children including on TV, computer, and tablet ($p < 0.05$), but there were no sex differences. In fully adjusted linear models, out-of-school screen-time was lower among those who had no screen-time at school ($p = 0.02$) and higher among older children ($p < 0.01$). Computer use was higher among older children ($p = 0.02$). Older children and those with lower maternal education were less likely to meet clinical recommendations based on TV viewing ($p < 0.05$). There were no observed associations with likelihood of meeting clinical recommendations based on total screen-time. BMI was not a significant predictor of screen-time. DISCUSSION/SIGNIFICANCE OF IMPACT: The majority of children exceeded AAP screen-time limits, with screen-time sharply higher among older children, and the associations did not vary by weight status. Children who attended schools that allowed screen-time had higher amounts of out-of-school screen-time. Pediatricians and healthcare providers should query parents on children's screen-time practices at home and at school and offer strategies to help families meet the clinical recommendations.

2208

Patient satisfaction with the Michigan Surgical and Health Optimization Program (MSHOP): A mixed methods study

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OBJECTIVES/SPECIFIC AIMS: This project has 2 overarching objectives: (1) to investigate the acceptability of the Michigan Surgical and Health Optimization Program (MSHOP) among referred patients, and to describe individual motivations behind enrollment Versus nonenrollment; and (2) to identify patient and program related factors associated with adherence and LOS and readmission rates. METHODS/STUDY POPULATION: Hypothesis—(1) MSHOP participants will report overall satisfaction with the program. Individuals that are satisfied with the program will be likely to perceive the program as effective. Subjects that declined MSHOP will be more likely to perceive their outcomes as immutable. (2) MSHOP patients will have shorter hospital stays and fewer readmission compared with patients who declined MSHOP. Methods—this study will use both qualitative and quantitative methods to investigate patient experiences and program efficacy. First, a convenience sample of patients who were referred to the MSHOP within the previous 12 months will participate in structured interviews to assess program acceptability, patient satisfaction with individual components of MSHOP, and perception of program efficacy. Interviews will also include patients who declined to enroll in MSHOP. Interviews for these subjects will include questions that assess why patients chose to decline enrollment. Second, there will be a retrospective cohort study comparing hospital outcomes among patients who enrolled in MSHOP Versus those who chose not to enroll. Analysis—interviews will be recorded and transcribed for thematic analysis to identify patterns associated with satisfaction or dissatisfaction with the MSHOP. Multivariate regression will be used to determine effect of MSHOP participation on postsurgical length-of-stay and 30-day readmission rate. Demographics and procedure type will be included as covariates. RESULTS/ANTICIPATED RESULTS: In total, 28 interviews have been transcribed, and are in the initial stages of thematic analysis. Interviews have thus far suggested that patients have been satisfied with MSHOP and would recommend the intervention to other patients. Retrospective data regarding hospital length of stay for MSHOP patients from September 2014 to December 2016 has been acquired and is being processed. The characteristics of patients that tend to participate more actively in MSHOP will be explored. We anticipate that active participation in the MSHOP will be associated with shorter hospital stays and fewer readmissions. DISCUSSION/SIGNIFICANCE OF IMPACT: This study will be one of the first to characterize patient perception of MSHOP, in particular its use of tracking step counts and breathing exercises to promote a form of prehabilitation that is easier to integrate into daily life. This project will investigate MSHOP's effect on patient outcomes, as well as explore factors that may associate with better patient adherence and outcomes. This would help further optimize the MSHOP as an intervention.

2239

Mobile enhancement of motivation in schizophrenia: A pilot trial of a personalized text message intervention for motivation deficits

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OBJECTIVES/SPECIFIC AIMS: Motivation deficits are one of the strongest determinants of poor functional outcomes in people with schizophrenia. Mobile interventions are a promising approach to improving these deficits, as they can provide frequent cues and reinforcements that support goal-directed behavior. The objective of this study is to describe the intervention protocol and initial effectiveness of a personalized mobile text message intervention, Mobile Enhancement of Motivation in Schizophrenia (MEMS). METHODS/STUDY POPULATION: This pilot study will examine the effects of MEMS compared with a control group using a randomized design. Up to 40 outpatients with a schizophrenia-spectrum disorder will be recruited. All participants will set individualized recovery goals to complete over an 8-week period; those randomized to receive MEMS will also receive 3 sets of personalized, interactive text messages each weekday to reinforce and cue goal completion. Before and after the 8-week period, participants in both groups will complete validated measures of motivation, quality of life, and functioning. Both groups will also report their goal attainment after 8 weeks. RESULTS/ANTICIPATED RESULTS: It is anticipated that those in the MEMS group will demonstrate greater goal attainment and improvements in motivation, quality of life, and functioning compared with the control group. DISCUSSION/SIGNIFICANCE OF IMPACT: This project will test the initial effectiveness of a novel intervention for improving one of the most debilitating aspects of schizophrenia.

2253

An analysis of how consumer physical activity monitors (monitors) are used in biomedical research

Stephen P. Wright and Kathryn Sandberg

OBJECTIVES/SPECIFIC AIMS: To analyze how consumer physical activity monitors are currently used in biomedical research. METHODS/STUDY POPULATION: Searches were conducted in Ovid Medline, PubMed Medline, clinicaltrials.gov, and NIH RePORTER using search terms including Fitbit, Jawbone, Apple watch, Garmin, Polar, Microsoft band, Misfit, Nike, Withings, and Xiaomi. Results were quantitated by category: condition/topic, intervention, enrollment status, study type and design, age, grant mechanism, and primary outcome. RESULTS/ANTICIPATED RESULTS: Fitbit is used >80%. There are 127 clinical studies using Fitbit devices listed in clinicaltrials.gov. In total, 48 have been completed while 79 are ongoing. Some studies have already published their findings; 40 papers cited in Ovid MEDLINE report use of a Fitbit device. NIH is now funding research that uses consumer physical activity monitors, and the NIH RePORTER shows the number of grants using Fitbit is rapidly increasing. DISCUSSION/SIGNIFICANCE OF IMPACT: The current state and potential growth of this technology is transforming biomedical research and is enabling us to ask new and more granular questions about activity and sleep in health and disease.

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2388

eResearch suite: A comprehensive platform for electronic consent and data collection

Melissa J. Mueller and Jason Kadrmas

OBJECTIVES/SPECIFIC AIMS: The goal of the eResearch platform is to make consenting for clinical trials more convenient, accessible, and faster while retaining an ethical and informed consenting process. eResearch e-consent also allows for enhanced standardization and efficiency for research collaborations across academic research institutions, which, ultimately, helps drive discovery of better health care for our patients and communities. METHODS/STUDY POPULATION: The UMN's CTSI and AHC Information Systems developed software, called eResearch Suite, for electronic consenting. The eResearch Suite includes viewing a consent, a "Check Your Understanding" quiz to assess comprehension of critical study details, and a signature block that captures the participant signature electronically and with an automatic date and time stamp. The eResearch Suite also has the capability to randomize participants, track participants via a master list, collect participant data, collect internal study data, and generate emails to participants. The eResearch Suite platform is written in Ruby on Rails. RESULTS/ANTICIPATED RESULTS: We have pilot tested the eResearch platform with one study thus far. Preliminary results of the study show that all participants consented via eResearch, with 64% of participants consenting remotely via eResearch before their first study visit. Participants e-consented using various devices including desktop computers, tablets, and smart phones. Participants also filled out surveys and questionnaires before their study visits, which saved the study team time and money. DISCUSSION/SIGNIFICANCE OF IMPACT: eResearch electronic consenting (e-consenting) changes the way potential participants consent for studies. e-Consenting is important because it allows individuals, or their Legally Authorized Representatives, to consent remotely. This may be faster, more convenient for people, reduce coercion, increase comprehension, and allow for consenting information or process to be shared with an individual's family/friends. In acute and emergent settings we anticipate eResearch e-consenting will result in significant reduction of consent time by replacing faxed and paper consent with e-consent available via email and mobile devices. This allows legally authorized representatives to sign consent remotely, reduces the time physicians spend faxing consents, and allow them to avert more focus back on their patients. Time savings, whether for consent or study visits, may also result in a cost savings for studies.

2433

Real-time health activity reporting of citizens in Lagos, Nigeria using mHealth app node

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OBJECTIVES/SPECIFIC AIMS: This study sought to develop a mHealth application which was capable of predicting the spread of infectious diseases during the height of the Ebola outbreak in Lagos, Nigeria. Following the success of this primary task, the research then sought to understand behavioral health issues which are indicative of chronic diseases, such as sedentary behaviors and where they occur at a geospatial level in real-time. The results of this study are now being used to develop a larger scale 500 person study in Rochester, NY, USA. METHODS/STUDY POPULATION: During a 3-month period individuals were asked to install a mobile health application known as Node onto the their android device. Consent was done remotely, individuals were recruited through the Lagos University Teaching Hospital, Nigeria Institute of Medical Research, and the University of Lagos. Participants were paid 50 USD/month for each month of study completion, while continuous location data was collected in addition to survey information about participants. RESULTS/ANTICIPATED RESULTS: During the study period 70 individuals enrolled, using this data we were able to create network based models which indicated that diseases were more likely to spread at the beginning of the week, and also indicated who would be most susceptible to being patient zero. In phase 2 we have started to look at behavioral patterns to determine the risk of chronic disease among our study population, by examining their human mobility patterns, since we can determine average sleep patterns, activity patterns using machine learning classifiers, and time spent in traffic—all of which we can visualize in a real-time geospatial manner with higher objectivity than traditional mechanisms for data collection. DISCUSSION/SIGNIFICANCE OF IMPACT: In developing countries, using Nigeria as our example most chronic disease and household studies only enroll a few thousand participants for a country numbering 150 million plus. Using our rapidly available application we were able within 1 week to enroll 70 participants on 1 year of funding, this creates a framework for larger scale public health studies which can be done in developing countries and also demonstrates the value in mHealth which can both answer questions of infectious disease and chronic diseases at the same time. Our results indicate that at an infectious disease level in city environments diseases may be prevented by targeting events early in the week. While at a chronic disease level the lack of reliable power results in less sedentary behavior as individuals seek locations to charge phones, while those with more stable western-like lifestyles have started to exhibit the conditions which cause such outcomes as obesity, which has begun to rise in developing countries. Ultimately, these results serve as a staging point to launch a more wide scale study both in the United States and Nigeria within the year, now that feasibility has been established.

2502

mZAP (Zonas, Accion y Proteccion): Empowering communities with mobile strategies for mosquito-borne disease control in tropical environments

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OBJECTIVES/SPECIFIC AIMS: Our objectives with this project are to engage communities through technology creating a communication channel with affected communities and stakeholders about mosquito-borne illness, vector control and environmental health risk. Furthermore, engaging communities to electronically map ecological risks that impact mosquito-borne illness with the goal of creating a mobile application that will work as an ecological surveillance against mosquito proliferation and potential mosquito population reduction, and finally pilot test and evaluate potential benefits in communities where the application was used. METHODS/STUDY POPULATION: We propose a methodology to perform formative community work that will underscore a distributed, democratized ecological surveillance through an integration of multidimensional health behavior theories that address the challenges of ZIKV in Culebra, a marginalized island community off the coast of the main island of Puerto Rico. Using participatory design, we will develop, test, and evaluate users' experiences towards mobile applications using qualitative (interviews) and quantitative (survey) methodologies. A mobile application with the capacity of mapping, use of social-media, crowdsourcing, and photo-voice in a dynamic and simple way will allow community members to alert "hot-zone" locations to the stakeholders interested in creating ecological action in their community. This multidimensional concept integrates explanatory and prospective approaches and will generate systematic short-term solutions for mosquito control and long-term solutions providing the necessary tools for community empowerment. RESULTS/ANTICIPATED RESULTS: Our proposed design will facilitate better understanding of the interactions between community members and socio-environmental determinants of mosquito-borne diseases. Furthermore, our proposed project will not only facilitate communication among members of a community, but also it will provide a platform for engagement and empowerment, establishing a change in the preventive paradigm of how communities face the negative impacts of micro-ecologies that surround them. DISCUSSION/SIGNIFICANCE OF IMPACT: Our proposed community collaboratory mHealth tool mZAP! (Zonas, Accion y Proteccion) will address the lack of community participation efforts against mosquito-borne diseases contributed simultaneously by the disengagement and disempowerment of community members. mZAP! will serve as an innovative tool to engage marginalized and communities made vulnerable in Puerto Rico. This approach should be successful as Puerto Rico is one of the most digitally connected countries in Latin America, with high mobile phone usage rates and social media use. Using mZAP!, communities will report and map breeding sites, use social media and crowd sensing, targeting against powerful tools against mosquito ecologies in their own environments. This application could result in an effective way to change the paradigms for public health approaches to use Information Communications Technologies (ICTs) to empower communities.

2537

Usability and adoption of the first enterprise-wide app prescribing platform, RxUniverse, in an academic tertiary care hospital

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OBJECTIVES/SPECIFIC AIMS: To assess the usability and adoption of RxUniverse, a novel platform that enables health care providers to directly disseminate proven, evidence-based mobile health apps to patients.

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METHODS/STUDY POPULATION: Among 5 pilot clinical sites, 40 physicians and front-line providers consisting of medical assistants and receptionists were trained on the RxUniverse platform. They were instructed on the platform's purpose, were shown a demonstration of the functionality, and were observed in a trial process of prescribing an app. Specific implementation plans were designed with the help of the clinic staff in order to best fit in with their present workflows. The well-validated System Usability Score (SUS) was used to assess the usability of the platform. Prescriptions of 100 relevant app prescriptions within a 8-week pilot period was set as the adoption goal. RESULTS/ANTICIPATED RESULTS: Within the pilot period, greater than 2000 apps were prescribed across all users. Of the 40 providers trained on the RxUniverse platform, 26 prescribed >5 apps during the trial period. Of these 26 individuals, 18 prescribed >20 apps, 14 prescribed >50 apps, and 5 prescribed >80 apps; 58% of users reported frequent use (weekly or daily) of the platform. In total, 19 responses were received for the SUS survey. The RxUniverse platform received a usability score of 82%. DISCUSSION/SIGNIFICANCE OF IMPACT: As the pace of innovation continues to accelerate, health care providers will need to quickly integrate new digital-based tools into their workflows, and patients will need to be able to easily and readily access these tools. RxUniverse provides the necessary mechanisms, user-friendly interface, and EHR integration functionality to accomplish this. The total number of apps prescribed surpassed 2000, which far exceeded the initial target of 100 apps. The platform also scored an 82% on the SUS, which is considered an "A" by industry standards. By comparison, other health apps considered to have to be in the highest-rating groups have reported scores of 77.5% and an overall average of 68% among all systems. These outcomes demonstrate the high adoption and usability of the RxUniverse platform, an important platform that can be used to prescribe the latest technologies directly to patients.

2546

Mobile use patterns among low-income parents and teens enrolled in outpatient substance abuse treatment

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OBJECTIVES/SPECIFIC AIMS: This study sought to determine the accessibility, utilization, and preference for mobile phone use among a marginalized population of teens enrolled in an adolescent substance abuse treatment program and their parents. Specific study aims were to: (1) characterize mobile phone use, (2) assess the accessibility and reliability of mobile phone usage, (3) determine specific barriers to mobile phone use, and (4) examine parent and teen perceptions of the utility of integrating communication technology in substance use treatment. METHODS/STUDY POPULATION: In total, 103 (78.6% female; 75.7% Hispanic) parents of teens participating in an outpatient substance abuse treatment program with an average age of 42.60 (SD = 9.28) participated in our study. Upon enrollment in a substance abuse treatment program between October 2014 and July 2016, parents completed a technology use survey as part of program development and a chart review of clinic outbound calls to parent mobile phones was completed to evaluate reliability of parent mobile phone access throughout treatment. Survey collection among teens is ongoing. Study population information for teens will be presented at the conference. RESULTS/ANTICIPATED RESULTS: The vast majority of parents owned a cell phone and used it as their primary phone (97.1%); 83% of parents owned smart phones in particular, with the majority being Android phones (68.7%). Parents were more likely to have pay-as-you-go (41.4%) and yearly (32.3%) contracts, and only 15% of the sample endorsed changing their phone number more than once in the past year (64% = never; 21% = once). Parents reported using several of the phone features: text (97%), email (76%), pictures (93%), and accessing the internet (92%); 92% reported they did not have a texting limit; and the most popular use of the mobile phone was to send and receive text messages (58.6%), followed by accessing the internet (19.2%). During the course of a 10-week treatment program, the clinic made 2776 confirmation phone calls to parents who completed surveys. Report of accessibility matched the clinic's ability to reach parents. Of the 2776 calls, 97.2% were made to the original number provided, which was in service. Only 2.7% were determined to be disconnected, with the median number of days for disconnected service being 2 days with no voice and no texting capabilities (range = 14) and 2 days with no voice, but with texting capabilities (range = 28). In terms of parent perceptions of the utility of integrating communication technology in substance use treatment, 91% of parents reported they would be receptive to receiving text messages with parenting tips as aftercare support. Preferred content areas included: strategies for monitoring teen substance use (56%), strategies for using consequences (62%), suggestions for encouraging positive activities (62%), and ways to improve parent-child communication (63%). Accessibility, utilization, and preference for mobile phone use in a treatment program among teen respondents will be presented at the conference. DISCUSSION/SIGNIFICANCE OF IMPACT: This study characterized both subjective and objective mobile phone accessibility and usability among teens participating in an adolescent substance abuse treatment program and their parents. This study also provides information on teen and parent perceptions of using mobile phones during the aftercare period and ratings of acceptable messages following treatment. This data will help researchers design mobile-based interventions both during and after treatment, which is the future direction of our research group.

EDUCATION/MENTORING/PROFESSIONAL DEVELOPMENT

2018

The translational integrator: Facilitating collaboration and bridging the "Valley of Death"

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OBJECTIVES/SPECIFIC AIMS: Translating conventional and regenerative medicine strategies from the research laboratory into the clinic is a complex process that can delay bringing novel therapies to the patient. Navigating the increasingly complex regulation surrounding cell-based and combination product technologies is a major challenge for the translational biomedical scientist. To this end, Mayo Clinic created a new position, the "Translational Integrator," as part of the cGMP Biomaterials Facility in the Center for Regenerative Medicine. METHODS/STUDY POPULATION: The Translational Integrator educates investigators about FDA standards and regulatory pathways; determines where the product is on the translational spectrum; works to understand the science behind the product; determines what additional studies may be needed; supports investigators in preparing for FDA communications and submissions; and educates researchers about institutional resources and funding mechanisms needed to move their product into manufacturing and trials. A primary objective is to meet investigators at an early stage in product development to avoid conducting potentially redundant work to meet regulatory requirements. RESULTS/ANTICIPATED RESULTS: Robust training in clinical and translational research methodology enables the integrator to facilitate the collaboration necessary between investigators, clinicians, institutional resources, regulators and funders to move products towards FDA IND/IDE approval and first-in-human trials. It is an iterative process using technology/translational readiness criteria, project management and review by subject matter experts that is highly interactive and customized to each project. Current projects include topics in orthopedic surgery and ENT. In creating and refining this position, several key lessons have been learned. DISCUSSION/SIGNIFICANCE OF IMPACT: First, the Translational Integrator must undergo constant reflection and assessment of investigator needs, which requires flexibility and understanding that their role may change in the context of each product. Second, the support that the Translational Integrator provides can shift the mindset of the investigator from being averse to engaging in the translational process to eager to move their product forward. Finally, for the investigator who does not personally want to move their work into first-in-human trials, establishing connections to intellectual property generation and licensing may support movement of their findings into patients.

2050

Improving evidence synthesis: Partnering with the Center for Clinical & Translational Science to build a Systematic Review Core

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OBJECTIVES/SPECIFIC AIMS: To improve the quality of evidence synthesis projects, including systematic reviews and other comparative effectiveness reviews, at the University of Utah. METHODS/STUDY POPULATION: Systematic reviews

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and other types of evidence syntheses are best when collaborative teams with expertise in multiple disciplines participate, including content experts, librarians and information specialists, systematic review methodologists, and statisticians. The Center for Clinical & Translational Science (CCTS), due to its interdisciplinary nature, connectivity to clinical experts, and existing Cores of methodologists, presented an opportune location for a Systematic Review Core. We designed the Systematic Review Core to focus on 2 primary aspects of evidence synthesis support: overall systematic review methodology guidance and in-depth information retrieval planning and execution. After establishing a conceptual partnership, a new position, Evidence Retrieval and Synthesis Librarian, was created to build capacity within the Core. RESULTS/ANTICIPATED RESULTS: Close connections with the CCTS's Population Health Research Foundation have led to better interdisciplinary coverage of systematic reviews and other evidence syntheses produced by the University of Utah. We are able to partner with statisticians and clinical experts from formulating the question to completing the final manuscript. Hourly rates charged through a cost recovery model have enabled us to grow our staff able to work on the Core, as well as offset costs for major databases and resources these bibliographic data-heavy research methods require. After 1 year of existence, the Core is already at maximum capacity, with no sign of slowing. Projects have ranged from brief consultations to highly intense interactions for the duration of the research spectrum. We have also been added as key personnel to grants with systematic review components. DISCUSSION/SIGNIFICANCE OF IMPACT: Systematic reviews and other evidence syntheses are a labor-intense, interdisciplinary team effort that fit well within the scope of CTSA's. They are a key component of the translation of science to practice, and can be used at all stages of the translational science spectrum. Quality of systematic reviews remains poor, particularly surrounding protocol development, sensitive search strategy design and reporting, and overall reporting. Librarians and information specialist involvement has been shown to positively correlate to the search strategy design and reporting aspects of systematic reviews, and librarians and information specialists increasingly act as systematic review methodologists. By including librarians and information specialists as part of the CTSA's official Core structure, these systematic review methodologists are able to connect with statisticians, other methodologists, and clinical experts in a nexus of interdisciplinarity. At the University of Utah, the visibility and structure provided by the CCTS helps the Systematic Review Core with promotion, creating connections and opportunities for collaboration across the campus. This partnership has already led to increased uptake in services, and over time, we believe it will increase the quality of the science produced. CTSA's have a natural partner with their health science library colleagues in translational science, as shown by this model.

2053

Evaluating impact of CTSA usage on research productivity outcomes

Yue Zang, Tom Greene, Trent Matheson and Erin Rothwell

OBJECTIVES/SPECIFIC AIMS: In this study, we propose to investigate effectiveness of 2 core services provided by the Center for Clinical and Translational Science (CCTS), home for CTSA program in the School of Medicine at the University of Utah. METHODS/STUDY POPULATION: We will apply a longitudinal database of research and tenure track faculty ($n > 600$) in the School of Medicine at the University of Utah from 2006 to 2016 to estimate the effect of initial usage of the biostatistics and clinical services cores of the University of Utah CCTS on the probability of (a) ≥ 1 peer reviewed publication, (b) external grant funding, and (c) academic promotion within 1, 2, and 3 years after the initial contact. We will apply a "new users" design (Hernan *et al.*, *Epidemiology*, 2008; 19: 766–779) to compare the outcomes of faculty initiating use of the 2 CCTS cores Versus faculty without prior use of these cores in a series of cohorts defined by the calendar year of initial contract with the
2 cores, with covariate adjustment performed within each cohort to account for measured confounders. Separate outcome models will be specified for each cohort, but the statistical models will be fit to stacked augmented data sets which include the data from each cohort. Using the stacked data set, results will be pooled across each of the cohorts to increase statistical power. Robust sandwich estimates of standard errors will be used to account for the inclusion of multiple assessments for each faculty member. RESULTS/ANTICIPATED RESULTS: Estimates of the effect of initiation of new CTSA usage on academic productivity outcomes will be obtained, and provided in conjunction with sensitivity analyses to address the potential impact of uncontrolled confounding. DISCUSSION/SIGNIFICANCE OF IMPACT: The proposed evaluation strategy should overcome some of the biases inherent in typical metrics for effectiveness of CTSA programs, and will be applied to evaluate success of future initiatives.

2068

Expanding capacity for Clinical and Translational Science by investing in research staff through the strategic teamwork for effective practice-mentor development program (STEP-MDP)

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OBJECTIVES/SPECIFIC AIMS: Skillful research staff members are critical to productive translational research teams and yet their ongoing professional development is rarely formally addressed. Through the Strategic Teamwork for Effective Practice-Mentor Development Program (STEP-MDP), we aimed to both create a community of practice (COP) for research staff and build the skills needed to enhance research team performance. METHODS/STUDY POPULATION: We selected 16 participants of 32 staff-level applicants from among the NYU Schools of Medicine, Social Work and Nursing for the first STEP-MDP cohort. Participants included research assistants, coordinators, managers, and directors. We delivered 3, two-hour workshops, scheduled 3 weeks apart, focused on team communication, identifying team areas for improvement, and mentorship/coaching skills. Peer-Coaching Teams (PCTs) were created by pairing participants at the same position level, and PCTs worked together at each session to explore and practice learned skills. Sessions featured brief didactics, group-based learning and exercises based on participants' real issues. A variety of active learning techniques such as brainstorming, role-playing, problem solving, and peer coaching were used. Practical core readings, worksheets, and summary cards were provided. PCTs met between sessions to practice coaching skills, and troubleshoot problems. RESULTS/ANTICIPATED RESULTS: Participants ($n = 16$) completed a 37-item retrospective pre/post self-assessment of team behaviors and skills, and a STEP-MDP evaluation survey at the end. We saw pre-post improvements in each of 5 self-assessment domains: Communication (4 items, pre-mean 2.66, post mean 3.36, $p \leq 0.001$), Leadership (8 items, pre-mean 2.76, post mean 3.55, $p \leq 0.001$), Empowerment and Motivation (12 items, pre-mean 2.86, post mean 3.51, $p \leq 0.001$), Coaching (6 items, pre-mean 2.40, post mean 3.58, $p \leq 0.001$), and Community (3 items, pre-mean 2.33, post mean 3.76, $p \leq 0.001$). On average, PCTs met twice (range 2–4 times) between workshop sessions. Learners valued the PCTs, and 1 commented on the value of working with peers in PCTs, having no one in a similar position within his immediate work environment. Participants' written comments strongly endorsed the value of the workshops for their work, with the coaching skills session seen as the most valuable. Some participants worry that skills will decrease over time without continued reinforcement. All but 1 participant reported that they planned to continue with the PCT. DISCUSSION/SIGNIFICANCE OF IMPACT: The number of applicants to our program suggests a need and motivation for staff to participate in the STEP-MDP. Participants' reported improved skills and sense of community. To maintain the COP and address worry about degradation of skills we are planning to remind PCTs to meet once a month and will follow-up with them 3 and 6 months post intervention to evaluate their continued development. This spring a second cohort will receive the training. We believe developing these core teamwork skills will lead to more collaborative, efficient, and innovative research. We have implemented a successful program targeting critical members of research teams with potential to facilitate expansion of institutional capacity for translational research. It will be important to understand the long-term impact of the program on individuals, on team science, on research, and ultimately on the health of the public.

2069

Competency indices for clinical research professionals

Carlton Hornung, Carolyn Thomas Jones, Terri Hinkley, Vicki Ellingrod and Nancy Calvin-Naylor

OBJECTIVES/SPECIFIC AIMS: Clinical research in the 21st century will require a well-trained workforce to insure that research protocols yield valid and reliable results. Several organizations have developed lists of core competencies for clinical trial coordinators, administrators, monitors, data management/informaticians, regulatory affairs personnel, and others. While the Clinical Research Appraisal Inventory assesses the self-confidence of physician scientists to be clinical investigators, no such index exists to assess the competence of clinical research professionals who coordinate, monitor, and administer clinical trials. We developed the Competency Index for Clinical Research Professionals (CICRP) as a general index of competency (ie, GCPs) as well as sub-scales to assess competency in the specific domains of Medicines Development; Ethics and Participant Safety; Data Management; and Research Methods. METHODS/STUDY POPULATION: We analyzed data collected by the Joint Task Force on

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the Harmonization of Core Competencies from a survey of research professionals working in the United States and Canada. Respondents reported how competent they believed themselves to be on 51 clinical research core competencies. Factor analyzes identified 20 core competencies that defined a Competency Index for Clinical Research Professionals—General (CICRP-General, ie, GCPs) and 4 subindices that define specialized research functions: Medicines Development; Ethics and Participant Safety; Data Management; and Research Concepts. RESULTS/ANTICIPATED RESULTS: Factor analysis identified 20 core competencies that defined a Competency Index for Clinical Research Professionals—General (CICRP-General, ie, GCPs) and 4 subindices that define specialized research functions: Medicines Development; Ethics and Participant Safety; Data Management; and Research Concepts. DISCUSSION/SIGNIFICANCE OF IMPACT: These indices can be used to gage an individual's readiness to perform general as well as more advanced research functions; to assess the education and training needs of research workers; and to evaluate the impact of education and training programs on the competency of research coordinators, monitors, and other clinical research team members.

2124

Three stages of cultural change in translational science

Joseph A. Kotarba

OBJECTIVES/SPECIFIC AIMS: This report describes the evolution of scientific culture since the NIH/translational science (TS) mandate. The transition of the conduct of science to an increasingly translational model involves 2 dimensions of change. The first dimension consists of change in the structure and process of scientific work, in terms of factors such as funding, administration, application of new knowledge, and so forth. The second dimension consists of change in culture of scientific work. The culture of science is the set of values, assumptions, meanings, and traditions that inform the conduct of science. As part of the comprehensive evaluation of TS at the University of Texas Medical Branch-Galveston, we have monitored the status of the culture of science there through a sociological framework. We focused on the ways the changing culture of science facilitates and/or inhibits creative and effective medical research. We argue that the long-term success of TS is dependent upon the evolution of assumptions, everyday practices, and taken-for-granted ways of conducting research. Culture also provides meanings for who its people are and helps us define who we are to ourselves (ie, self-concept). In terms of the scientific enterprise, self-identity provides the motivation to participate in group activities or to be content with being a "lone ranger" researcher; the orientation to be either a leader or a follower; the security to take creative chances with one's work or to simply conduct "normal science"; and the sense of esteem for being the best or simply doing one's job. TS requires a constant "reengineering" of its total enterprise. Consequently, we raised the following research questions: (1) What is the traditional culture of science at UTMB? (2) How has the culture of science at UTMB changed since the introduction of the Clinical and Translational Science Award project? (3) What has been the relationship between the culture of science and the conduct of science at UTMB since CTSA? (4) How have cultural influences on self-concept changed? METHODS/STUDY POPULATION: Data have been collected by means of ongoing 1-on-1 interviews with CTSA participants at all levels; observations of lab and classroom interaction; participation in organizational and planning committees; and other everyday organizational activities. RESULTS/ANTICIPATED RESULTS: Following the grounded theory method of qualitative analysis and discovery, we found 3 stages of cultural change. Stage 1 is Cultural Invasion of the existing culture at UTMB by the implementation of the CTSA project. Stage 2 is Cultural Accommodation by which internal responses to change follow the normal scientific paradigm. Stage 3 is Cultural Expansion by which the organizational and cultural platform for conducting science has expanded regionally, nationally and cross-disciplinarily. DISCUSSION/SIGNIFICANCE OF IMPACT: Whether a distinct fourth stage emerges depends on such factors as funding and programmatic directives from NIH; the tension between research and clinical demands for resources; and the emergence of junior investigators schooled on the principles of TS.

2134

Integrating Epidemiology and Biostatistics teaching using the case method

Jessica K. Paulus, Angie Rodday and Farzad Noubary

OBJECTIVES/SPECIFIC AIMS: Biostatistics and Epidemiology courses within clinical research or public health training programs are typically developed and taught separately. As a result, students may have trouble in their research outside the classroom, where biostatistical and epidemiological concepts must be well integrated. Case method teaching is a participant- and discussion-centered pedagogical approach that has been used in business and law schools for more than 50 years to improve student learning, yet has taken longer to be adopted in health professional schools. The case method is distinguished by presenting learners with a real-world problem without a single unique solution. Designed to mimic the constraints and incomplete information found in real life, it is an ideal approach for integrating multiple related disciplines. A team of Clinical and Translational Science (CTS) faculty from the Tufts CTSI collaborated to develop a new course that integrates epidemiology and biostatistics disciplines using the case method. METHODS/STUDY POPULATION: We developed an intermediate-level, case-based course integrating epidemiology and biostatistics topics using modern, real-world clinical examples. Recognizing the importance of technical skill building, this intermediate-level Tufts CTS course adopted a hybrid approach, incorporating lecture and in-class laboratory exercises, alongside cases. We surveyed CTS faculty to identify a set of core methodological competencies. These included randomized trials, case-control and cohort studies, confounding, effect modification, propensity scores, linear and logistic regression, and survival analysis. Faculty provided us with clinical questions and deidentified data sets corresponding to these competencies; we also reviewed publicly available data sets. RESULTS/ANTICIPATED RESULTS: CTS faculty collaborated to develop 10 cases (with accompanying data sets) from modern clinical research examples that illustrate the connections between epidemiology and biostatistical concepts. Each case contains a background section, a statement of the core problem, a data set with data dictionary, articles from the primary literature (often the publication of the data set) with discussion questions and in-class lab exercises (R programming). One case presents students with the challenge of whether acupuncture may be an effective therapy for pain associated with chronic headache. Through case activities, students gain experience weighing observational Versus experimental evidence, apply directed acyclic graph theory, and analyze clinical trial data. Qualitative evaluations in 2015 (pilot year) and 2016 indicate students preferred the integrated approach to separate courses, and found the integration facilitated application of methods to their independent research projects. Significant rewards for faculty include cross-disciplinary collaboration, sharpened teaching skills, and engaging with learners in a dynamic classroom environment. DISCUSSION/SIGNIFICANCE OF IMPACT: Despite administrative and pedagogical challenges, a case-based, integrated curriculum offers rewards for faculty and students. The case method may be a useful pedagogical strategy to integrate other closely related topics or courses in translational science to better prepare scholars for the challenges of independent research.

2142

A competency-based approach to redefining clinical research workforce quality and development

Rebecca Namenek Brouwer and Denise Snyder

OBJECTIVES/SPECIFIC AIMS: Describe the process used to develop job descriptions and how this translates into consistent hiring practices. Describe how competencies are used to provide transparency into professional development opportunities. Discuss planned incorporation of competencies into efforts to train the clinical research workforce. METHODS/STUDY POPULATION: These processes were developed at Duke, an academic medical center with over 2000 active clinical research protocols and 300 new clinical trials per year. Over 1000 employees were evaluated for mapping into clinical research positions, with 685 mapping into new research positions (makeup of workforce to be depicted). RESULTS/ANTICIPATED RESULTS: Prior to this initiative, the clinical research workforce was not well-defined. Through the mapping process, employees were mapped from over 80 different positions into 10 (figure), resulting in a workforce that allows for visible career ladders and greater opportunity for development. As the initiative evolves and grows to include competency-driven performance evaluations, training modules, and assessments, we anticipate the ability to see the relationship between the competencies and high-quality clinical research support. DISCUSSION/SIGNIFICANCE OF IMPACT: The use of competencies in the context of workforce development is not new, yet in clinical research, they provide a much-needed framework for an ever-evolving profession. This comprehensive use of competencies throughout a workforce development initiative is key to ensuring strong support of high-quality clinical research.

2151

Using social network analysis to design and evaluate CTSA pilot programs

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OBJECTIVES/SPECIFIC AIMS: We aim to leverage our analysis of the scientific collaboration network at a research university to design an innovative pilot

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program and foster scientific productivity. We test the impact of creating a new collaboration in a research community, which decreases the average network distance and accelerates the diffusion of information and expertise among the community's investigators. METHODS/STUDY POPULATION: We mapped the whole network of co-authorship on publications and co-participation on extramurally awarded grants at the University of Florida (UF) between 2013 and 2015. We used network science methods to identify research communities of investigators who have consistently worked together and/or have other collaborators in common with at least one researcher based in the UF Health Science Center. We selected pairs of communities with (i) similar productivity levels, research interests, and network structures and (ii) no research projects in common. Communities in each pair were randomly assigned to a treatment or control group. In each treatment community, we selected 1 pair of investigators who had not collaborated in the past 3 years and whose connection would maximally reduce average network distance in the community. The pair was provided with an economic incentive to collaborate for the submission of a CTSA pilot proposal. RESULTS/ANTICIPATED RESULTS: We successfully identified 15 pairs of treatment/control communities. In each of 8 treatment communities, a pair of potential collaborators agreed to participate in the intervention. DISCUSSION/SIGNIFICANCE OF IMPACT: Network-informed Clinical Translational Science Awards (CTSA) pilot programs can identify research communities and create innovative collaborations. Statistical experiments can establish the programs' causal effects on scientific productivity.

2164

Emotional dysfunction and stigma: Its effects on HIV-associated neurocognitive disorders (HAND)

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OBJECTIVES/SPECIFIC AIMS: HIV is a chronic disease that affects the immune system. HIV+ people live more thanks to effective antiretroviral treatments. The scientific data demonstrate that HIV+ is associated to the cognitive impairment presented in the 50% of the patient. The objective of this study is to determine the correlation between emotional dysfunction and perceived stigma in HIV+ women and its effects HIV-associated neurocognitive disorders (HAND). METHODS/STUDY POPULATION: HIV+ women will be recruited form the Hispanic Longitudinal Cohort and evaluated questionnaires for emotional dysfunction and stigma, neuropsychological tests, and MRI. RESULTS/ANTICIPATED RESULTS: We anticipated that women with HIV+ will experience higher levels of emotional dysfunction (ie, fear) and perceived stigma when compared with the control group. Women with HIV infection will present an association between emotional dysfunction most like fear and perceived stigma when compared with the control group. This correlation will be associated with HAND. The women with HIV infection will present circuit integrity dysfunction associated with emotional dysfunction and perceived stigma as determined by DTI and connectivity (MRI). DISCUSSION/SIGNIFICANCE OF IMPACT: HIV stigma and emotional dysfunction have a negative impact in quality of life (QOL). This effect can be improved with several treatment interventions with eventual improvement in adherence, emotional control, and QOL.

2175

An exploratory study of how physicians' identities inform clinical practice

Candace Chow, Carrie L. Byington, Lenora M. Olson, Karl Ramirez, Shiya Zeng and Ana Maria Lopez

OBJECTIVES/SPECIFIC AIMS: Knowing how to deliver culturally responsive care is of increasing importance as the nation's patient population diversifies. However, unless cultural competence is taught with an emphasis on self-awareness (Wear, 2007) and critical consciousness (Kumagai and Lypson, 2009) learners find this education ineffective (Beagan, 2003). This study examines how physicians perceive their own social identities (eg, race, socio-economic status, gender, sexual orientation, religion, years of experience) and how these self-perceptions influence physician's understandings of how to practice culturally responsive care. METHODS/STUDY POPULATION: This exploratory study took place at a university in the Intermountain West. We employed a qualitative case study method to investigate how academic physicians think about their identities and approaches to clinical care and research through interviews and observations. In total, 25 participants were enrolled in our study, with efforts to recruit a diverse sample with respect to gender and race as well as years of experience and specialty. Transcriptions of interviews and observations were coded using grounded theory. One major code that emerged was defining experiences: instances where physicians reflected on both personal and professional life encounters that have influenced how they think about themselves, how they understand an aspect of their identity, or why this identity matters. RESULTS/ANTICIPATED RESULTS: Two main themes emerged from an analysis of the codes that show how physicians think about their identities and their approaches to practice. (1) Physicians with nondominant identities (women, non-White) could more easily explain what these identities mean to them than those with dominant identities (men, White). For example, women in medicine had much to say about being a woman in medicine, but men had barely anything to say about being a man in medicine. (2) There was a positive trend between the number of defining experiences a physician encountered in life and the number of connections they made between their identities and the manner in which they practiced, both clinically and academically. It appeared that physicians who have few defining experiences made few connections between identity and practice, those with a moderate number of experiences made a moderate number of connections, and those with many experiences made many connections. Physicians who mentioned having many defining experiences were more likely to be able to articulate how those experiences were incorporated into their approaches to patient care. DISCUSSION/SIGNIFICANCE OF IMPACT: (1) According to literature in multicultural education, those with dominant identities do not think about their identities because they do not have to (Johnson, 2001). One privilege of being part of the majority is not having to think about life from a minority perspective. This helps to explain why women and non-White physicians in this study had more anecdotes to share about these identities—because they have had defining experiences that prompt reflection on these identities. (2) We propose that struggles and conflict are what compel physicians to reflect on their practice (Eva *et al*., 2012). Our findings suggest that physicians are more prepared to apply what they have learned from their own identity struggles in delivering culturally responsive care when they have had more opportunities to reflect on these identities and situations. Findings from this study have implications for transforming approaches to medical education. We suggest that medical education should provide learners with the opportunity to reflect on their life experience, and that providers may need explicit instruction on how to make connections between their experiences and their practice.

2200

Best practices for social and behavioral research: A new course to address good clinical practice and preliminary course evaluation

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OBJECTIVES/SPECIFIC AIMS: To conduct a preliminary evaluation of the Social and Behavioral Research Best Practices Course. METHODS/STUDY POPULATION: Learners are sampled from 5 institutions: University of Michigan, University of Rochester, University of Florida, Boston University, and University of Buffalo. Learners who take the course and consent to be in the study receive a web link to a survey immediately after course completion and at 2–3 months follow up. In addition to demographic information, learners will report their perceptions of usefulness and relevance of the course to their job, their satisfaction with the course and associated job aids, and at follow-up, if and how the course impacted their work. Additional information will be collected from the learning management systems which host the course at each institution. The data collected will include the number of participants who take the course, the number who complete, how many times the course was attempted, and pass rates. RESULTS/ANTICIPATED RESULTS: We anticipate that several hundred learners will take the course by the end of our project. Of learners who agree to participate in the survey, we anticipate that they will find the course useful and relevant to social and behavioral clinical trials and will be satisfied with the course. Information including suggestions about missing content, items or content that were not extremely clear, or any other comments will be collected to iterate and expand the course. DISCUSSION/SIGNIFICANCE OF IMPACT: This course was developed to fill a gap in training in good clinical practice for social and behavioral research. An evaluation of how the training provided in the course impacts the jobs of learners is needed both to ensure that the most relevant information is included in the course as well as to identify ways that the training may contribute to the quality and safety of social and behavioral clinical trials.

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2235

Equipping health professional students to apply pharmacogenomic data to clinical decision making in real-world scenarios: Comparison of an active engagement Versus didactic teaching approach

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OBJECTIVES/SPECIFIC AIMS: Compare effectiveness of a patient case-based, interactive teaching approach that included optional student genotyping with traditional didactic teaching strategies for increasing students' knowledge and ability to effectively use pharmacogenomic data in clinical decision making. METHODS/STUDY POPULATION: The UF College of Pharmacy offers a required Personalized Medicine (PM) course for pharmacy students as well as an elective course, Clinical Applications of Personalized Medicine (CAPM). Students dual enrolled in the PM and elective CAPM courses comprised the intervention (INT) group, with interactive patient case-based teaching and the option to undergo personal genotyping, whereas students enrolled in PM alone comprised the control (CTR) group, which primarily used a traditional didactic teaching format and did not include personal genotyping. Both groups completed a pre- and post-course patient case-based test (15 questions/1 point each) to evaluate their knowledge and abilities to apply genotype and other patient-specific data to drug therapy recommendations. Pre- and post-course test scores for knowledge were compared between the INT and CTR groups using the Student *t*-test. RESULTS/ANTICIPATED RESULTS: In total, 52 students completed surveys (INT group, n = 21; CTR group, n = 31). Race was similar between groups, but there were fewer females in the INT compared with CTR group (8 vs. 22, $p = 0.02$). Pre-course knowledge scores did not differ between INT and CTR groups (6.8 ± 2.2 vs. 6.3 ± 1.6 respectively, $p = 0.34$), however, post-course scores were significantly higher in the INT Versus CTR group (10.0 ± 2.3 vs. 7.5 ± 1.7, $p < 0.0001$). DISCUSSION/SIGNIFICANCE OF IMPACT: There have been significant advancements in the clinical applications of pharmacogenomic and genomic data, however, barriers to routine clinical adoption of genomic medicine persist. Developing education and training methods that equip practitioners to effectively translate genomic data into evidence-based clinical recommendations has been identified as a key strategy to overcome such barriers. Our data suggest that a personalized medicine course that employs patient-centered, case-based teaching strategies and includes optional personal genotyping for students compared with traditional didactic instruction improves students' knowledge and abilities to apply pharmacogenomic data in practice-based scenarios. These results can inform future strategies for educating healthcare professionals on the clinical use of pharmacogenomic and genomic data.

2244

Objectively assessing student learning and effectiveness of an introductory educational program in clinical and translational research

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OBJECTIVES/SPECIFIC AIMS: The first goal of this project is to test the reliability and validity of an objective structured clinical exam (OSCE) that was designed to assess competency in clinical and translational research. The second goal is to evaluate the impact of MICHR's Summer Research Program on the participating trainee's competency development. METHODS/STUDY POPULATION: The methodology used for this study was reviewed and exempted from oversight by the U-M Institutional Review Board (HUM00113293). The participants in the study include 17 pre-doctoral students in health professions programs at U-M who participated MICHR's Summer Research Program. The Research OSCE was administered using a pretest, post-test design. The pretest was administered once during the 1st week of program in the Summer of 2016 and the post-test during the 10th week of the program. The Research OSCE was proctored and rated by trained staff members. We will assess the reliability of the Research OSCE using Generalizability Theory (Webb *et al*., 2006). And the construct validity of the Research OSCE will be tested using factor analysis and other statistical analyses. Growth in the competence of the trainees participating in the Summer Research program will be evaluated by testing for significant differences between their pretest and post-test scores. RESULTS/ANTICIPATED RESULTS: We anticipate that this study will show that the Research OSCE is a reliable competency assessment with proven construct validity. We also anticipate that the use of the Research OSCE will show the trainees participating in the Summer Research program experienced a gain in competence during the course of the 10-week program. DISCUSSION/SIGNIFICANCE OF IMPACT: This project uses a common and standardized testing approach. The primary goal of this project is to evaluate the reliability and validity of an OSCE to assess competency in clinical and translational research. It represents a new application for a well-studied testing method used extensively in the health professions to assess the clinical competency of health practitioners. This project will lead to a better understanding of (a) the reliability and validity of the Research OSCE designed to test research competency and (b) the effectiveness of the Summer Research Program curriculum in better preparing participants to conduct clinical and translational research. Showing how a specific competency assessment can be used for this purpose will provide the administrators, evaluators, and other stakeholders of clinical and translational research training programs with information that can be used to design more rigorous and relevant evaluations of their research training programs.

2260

Silicone renal tumor models: The validation of a surgical training tool

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OBJECTIVES/SPECIFIC AIMS: More partial nephrectomies are performed every year as a surgical treatment for kidney cancer. However, this procedure remains technically challenging. Surgeons require a substantial number of cases before their performance plateaus. No established practice mode exists; thus, there is a need for training models to simulate real tumor excisions and kidney suturing. In this study, we seek to validate these silicone models using multiple simulations with urologists of different training levels. METHODS/STUDY POPULATION: We created silicone renal tumor models using 3D printed molds of a patient's kidney with a mass. Medical students, urology residents, fellows, and attending surgeons are recruited to perform simulated partial nephrectomies on these models. Four trials are performed with a da Vinci surgical robot on 2 different days. We are evaluating surgeon performance and improvement using validated measures as well as operation-specific metrics. Operation-specific metrics include renal artery clamp time and surgical margins. Validated measures of self-assessed operative demand (NASA TLX) and reviewer-assessed surgical performance (GEARS) are also recorded across trials. RESULTS/ANTICIPATED RESULTS: The preliminary results of 2 medical students, 10 urology residents, 3 endourology fellows, and 2 attending urologists are reported here. Model face validity was evaluated on a 0–100 sliding scale anchored at unrealistic and realistic. Mean results thus far are 77.7 for overall feel, 82.7 for needle driving, 75.6 for cutting, and 73.2 for visual representation. Between trials 1 and 4 there was a mean reduction of 3.26 minutes in renal artery clamp time, and a 75% reduction in positive margins. There was a reduced incidence of positive surgical margins with advanced training stage. Fellows, residents, and medical students had positive tumor margins in 25%, 50%, and 75% of their trials, respectively. We expect to recruit 15 additional subjects for this study. Upon completion of data acquisition, more robust statistical comparisons and measures will be reported. DISCUSSION/SIGNIFICANCE OF IMPACT: Face validity measures indicate the model adequately represents reality. Preliminary data suggest improved surgical performance over the course of the training and better performance in urologists of higher training levels. This model may have potential for broader application and integration into minimally invasive surgery training programs.

2268

A new framework for stakeholder engagement in early stage translational science

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OBJECTIVES/SPECIFIC AIMS: Stakeholder and community engagement (SCE) is a national priority for the National Center for Advancing Translational Science (NCATS). An established framework for stakeholder engagement exists for the latter stages (T2-T4) of translational, but no such framework currently exists for early stages of translational science (T1). Four Clinical and Translational Science Award (CTSA) hubs launched a collaboration to develop a new framework for engaging communities and stakeholders in T1 research. METHODS/STUDY POPULATION: We led structured individual and group discussions with T1 investigators to learn about: (1) the health decisions they seek to inform with research evidence, (2) the actors who make those decisions, and (3) the individuals and organizations that are affected by those decisions. In total, 18 individuals connected to 4 CTSA hubs participated in the

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discussions. Participants came from the fields ranging from basic chemistry and drug development to infectious disease and pediatrics and represented both methodological and topical experts. Focus groups lasted, on average, 1 hour, were audio recorded. Interviews lasted ~30 minutes. Audio recordings were transcribed and deidentified, and transcripts were coded using Dedoose™. We used a deductive-inductive procedure to develop the framework for stakeholder engagement in T1 research. A deductive codebook was development from the focus group and interview guides; emergent themes were added and the codebook was revised after preliminary inductive analysis. Two coders analyzed all transcripts using a constant comparison approach. We used an inductive process to identify themes and form them into a framework that could be used by T1 researchers in their work. The framework was developed through sequential reviews with coauthors and research participants. RESULTS/ANTICIPATED RESULTS: Preliminary findings suggest that stakeholders in early stage translational research (T1) do not fit into the same framework as those further down the translational spectrum (T2-T4). Basic scientists can identify stakeholders, however, and would like more guidance on who, how, and when to engage them in their research. DISCUSSION/SIGNIFICANCE OF IMPACT: By showing T1 researchers how to identify and involve their stakeholders in (1) defining research questions, (2) carrying out research activities, and (3) disseminating research evidence, this work has the potential to improve the use of basic science evidence in latter stages of translation from bench to bedside.

2292

Implementation and dissemination of a unique training program in stem cell biology and regenerative medicine

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OBJECTIVES/SPECIFIC AIMS: Provide an innovative, integrative, and inter-disciplinary training program which will leverage a unique and internationally recognized strength of BU and establish an environment that facilitates translational team science interactions with MD scientists and clinicians, thereby synergistically bridging research strengths with interdisciplinary approaches. METHODS/STUDY POPULATION: This overall mission of the RMTP is pursued through 2 independent aims. Aim 1: Provide an innovative, integrative, and interdisciplinary training program which will leverage a unique and internationally recognized strength of BU. Aim 2: Establish an environment that facilitates translational team science interactions with MD scientists and clinicians, thereby synergistically bridging research strengths with interdisciplinary approaches. To achieve these aims, we have developed a specialized didactic curriculum that is fully integrated in graduate school training and can be shared for the benefit of others outside of the BU community. We are also developing online iPSC practicum workshops for more efficient distribution of didactic content. Interdisciplinary team science approaches to stem cell research related to cures for human diseases are fostered across investigators across diverse hubs at BU, BU Medical Center, the Charles River Campus and the Framingham Heart Study. All methodology, data and materials are provided in a transparent and open-source manner to benefit the greater scientific community and ensure rigorous reproducibility. RESULTS/ANTICIPATED RESULTS: As a nascent TL1 training program, we are just arriving at the end of our second year. At this point, 5 out of a total of 11 appointed trainees have concluded RMTP support, all of whom have transitioned into biomedical science-related pursuits; 2 predoctoral trainees were awarded F31 fellowships, 2 postdoctoral trainees were awarded career transition grants (K99/R00 and LERN fellowship), and 1 postdoctoral trainee became a Senior Scientist at a Biopharmaceutical company. Given the quality of our trainees and their RMTP mentors, we anticipate that close to 100% of those supported by this mechanism will continue their career development in the biomedical sciences. DISCUSSION/SIGNIFICANCE OF IMPACT: Implementation of the RMTP TL1 would not only serve to increase the capacity of trainees within the CReM, but would also extend the scope of regenerative medicine research to other CTSI-participating hubs and more broadly to other scientific disciplines.

2305

Advancement of translational sciences: Development of an interprofessional program and outcome measures for foundational, clinical, and health care researchers

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OBJECTIVES/SPECIFIC AIMS: To improve translational research, we have developed a program called Duke Multidisciplinary Education and Research in Translational Sciences (Duke MERITS). Duke MERITS will facilitate cross-disciplinary collaboration among faculty involved in foundational, clinical and/or health care research and in turn also prepare them to train the next generation of translational researchers. METHODS/STUDY POPULATION: The program aims are (1) to define metrics and outcomes measures so faculty can track their progress and identify impact of their collaborative research in translational sciences; (2) to offer a multi-modal faculty development series to promote team science, improve didactic teaching, and incorporate innovative resources to promote interdisciplinary approach to translational research; (3) to provide module-based hands-on-training sessions in bench to bedside research and training in translational grant writing to facilitate the development of multidisciplinary research collaborations. The present study describes results from Aim 1 and includes (a) development of baseline outcome assessment tools necessary to gauge the impact of our programs on both the participating faculty and the research culture within Duke University, (b) impact of a specific course offering in Translational Medicine. In order to achieve this, we conducted multiple focus group sessions with faculty self-identified as junior-, mid-, or advanced-career, a mixed group at any career level and included a group of graduate students and postdoctoral trainees to study the impact of a graduate level course in Translational Aspects of Pathobiology. The activities during these translational science focus groups were designed to define what successful translational science is, to determine what resources support translational Science at Duke, and to decide what resources we need in order to enhance Duke's position as a leader in research and scientific education. RESULTS/ANTICIPATED RESULTS: We identified that translational science is changing standards while incorporating leadership, teamwork, collaborations, and movement primarily focusing on the overall goal of improving all aspects of health. Participants categorized their field of study and the fields of their coparticipants most frequently as basic discovery and a combination of intervention and health services. The most frequently identified pros/benefits of performing translational science at Duke include industry connections, collaborations with other departments resulting in disciplines being bridged, improving patient care, and access to resources as well as money. The most frequently identified cons/barriers of performing translational science includes the expensiveness, silos, and lack of resources willing to absorb risks. DISCUSSION/SIGNIFICANCE OF IMPACT: The identification of these defined factors from the focus groups has allowed us to issue a comprehensive, sliding Likert scale-based anonymous survey from the secure RedCap system and is being rolled out throughout Duke University, including schools of medicine, nursing, Trinity, biomedical engineering. We envision that Duke MERITS education program will facilitate interprofessional efforts, which we define as a team science approach to identify the clinical "roadblock" and then seek an innovative approach or technology to help overcome this "roadblock"? It can facilitate institutional and departmental recognition in faculty career development. The common goal is to gain fundamental new insights that will result in significant improvement of the existing "standard of care" and meet the challenges of dwindling extramural support.

2315

Documenting ADAPT (Addressing Disparities in Asian Populations through Translational research): The growth of a community-research collaborative

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OBJECTIVES/SPECIFIC AIMS: Addressing Disparities in Asian Populations through Translation research (ADAPT) is a community-research partnership funded by the Tufts Clinical Translational Sciences Institute (CTSI). Founded in 2011, this collaborative brings together 7 Chinatown-serving community-based organizations and academic researchers with the goal of improving health for the local Chinatown community and beyond. The goal of this research project was to document the best practices, lessons learned, and process through which ADAPT has developed and grown. The aim of this project is to disseminate the model to other CTSAs who are currently engaged in METHODS/STUDY POPULATION: We used a combination of qualitative interviews and content analysis to gather data on the evolution of ADAPT over the last 5 years. Current members from both community organizations and the university/medical center were interviewed about their experiences participating in ADAPT. When possible, interviews were recorded and transcribed verbatim. Deidentified transcripts and administrative documents including meeting minutes, conference summaries, bylaws, and mission statements were coded using Dedoose analytic software. RESULTS/ANTICIPATED RESULTS: Established community-based participatory research (CBPR) principles, including mutual respect, transparency, and commitment, are viewed as necessary, but not sufficient. Patience—both with other members and with the group as a work in progress—is highlighted as being a necessary characteristic of

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participants. Time and funding are 2 of the most important resources, and the majority of members agree that there is no substitute for "skin in the game." Attempts at last minute, opportunistic engagement were provided as examples of what had not worked. One ongoing tension is the balance between process and product. Individual members are beholden to organizations to different degrees, and the need to produce something in the form of publications or grant money can limit the amount of time members can commit to the collaborative. At the same time, these products are unlikely to materialize if members are not invested in the process of growing and sustaining the collective. DISCUSSION/SIGNIFICANCE OF IMPACT: Out of the 7 community organizations who currently participate in ADAPT, only 1 is explicitly focused on health in the traditional sense. The others are primary service organizations, but because they understand the impact of the social determinants of health on the local community—including housing, employment, education, nutrition, among other factors—the research collaborative is able to leverage the knowledge and expertise of the academic researchers and the community partners to focus on health topics most salient to the local Chinatown community.

2348

Collaborative translational workforce development: Standardizing clinical research nursing education in good clinical practice

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OBJECTIVES/SPECIFIC AIMS: The proposed pilot study seek to enhance the network of CTSAs at Rockefeller University, NYU, ISMMS, and other community members to support translational workforce development of clinical research nurses and establish a standardized nurse-specific training curriculum in GCP for use within the CTSA network, in other research centers, and in nursing school curricula. This will be coupled with a rigorous evaluation study to test the impact of the training and a comprehensive dissemination plan to make the training available to all nurses and nursing students via modern e-learning method. Aim 1. To create an integrated network of local CTSAs and community partners to develop, validate, and refine a pilot e-learning GCP educational and training program and content and outcomes dissemination plan. It is vital to integrate the efforts of CTSA leaders, community partners, and nursing educators to develop a pilot e-learning nurse workforce training curriculum and the associated evaluation measures and assessment plan. Delphi methods will be employed, coupled with rigorous assessment of face validity, content validity, and item reliability. The resulting educational training program will then be used for an e-learning educational intervention study in CTSAs, other sites, and nursing schools. Aim 2. To test the effect of the pilot GCP education and evaluation program for practicing clinical research nurses (CRNs) within the collaborating CTSAs and community partners, we will perform a randomized controlled trial using a Solomon 4 group design. For the student nurse population, we will develop a randomized control trial using a Solomon 4 group design blocked on course section. As this is a pilot study, descriptive statistics and confidence intervals around parameter estimates will be constructed. In addition, inferential statistics will be calculated on primary outcome of interest (change scores in knowledge of GCP) and measures of heterogeneity of data, patterns of missing data, and reliability of evaluative tools will be analyzed. Aim 3. To implement a dissemination plan to reach both nurses practicing the CRN specialty within CTSAs and other community settings. We will disseminate the program to other CTSAs through the CTSA network communication resources. To broaden the reach to a population of nurses and student nurses with limited prior education or training in nurse-specific GCP competencies, but who provide care to research participants in nontraditional research settings, we will craft a novel set of dissemination methods, including the CITI Program electronic platform that can be accessed by nurses and nursing students across settings. In addition, dissemination will be at nursing education meetings and in nursing journals.METHODS/STUDY POPULATION: There are several components to this pilot program. The component that includes a research strategy is the testing of the effectiveness of the training and educational interventions on GCP knowledge and efficacy. Study cohort: Recruitment of study subjects will be in coordination with 3 CTSA collaborators and community partners for 2 samples: (1) nurses who provide care to clinical research participants across a variety of settings (health care systems, research hospitals, and care provider networks) and who are already trained according to current standard in GCP, (2) nursing students from the collaborative network of the 3 CTSAs, NYU School of Nursing has agreed to pilot test the introductory student module. The methodological approach will be a random assignment control trial Solomon 4 group design for practicing CRNs within the collaborating CTSAs and community partners. For student nurse population, the methodological approach will be a randomized-control trial Solomon 4 group design blocked on course section. Survey measures of CRN GCP knowledge and efficacy will be obtained pre and post educational intervention. RESULTS/ANTICIPATED RESULTS: Aim 1. Expected outcomes are pilot e-learning nurse workforce training modules curriculum, and evaluation measures and plan appropriate for CTSAs, community sites, and nursing schools. Specifically, 14 modules (averaging 30 minutes each) for practicing CRNs, and one 45 minute module for nursing students. The significance of these findings will provide a framework for the e-learning educational intervention study. CITI Program is enthusiastic about the module development and refinement and will provide direction for consistency in formatting with current CITI Program modules, set-up of learner groups for comparison, and evaluative measures such as completion data and scoring. Aim 2. Expected outcomes are an effective pilot educational intervention for practicing nurses and students and valid and reliable evaluation tools and plan that can be generalized to the larger CRN and nursing community. Aim 3. Expected outcomes are an enhanced CTSA dissemination plan that includes non-CTSA resources and reaches non-CTSA employed nurses and nursing students. DISCUSSION/SIGNIFICANCE OF IMPACT: The expected outcomes of this pilot study are: (1) an enduring GCP education that can be continually updated and training structure for CRNs, and nurses and nursing students throughout the United States; (2) a reproducible effective standardized basic nurse-specific GCP curriculum for dissemination; (3) assessment tools to evaluate programmatic success, nurse and nursing student knowledge and efficacy on nurse-specific GCP; (4) and a CTSA dissemination plan that to reach non-CTSA nurses and nursing students. Our ultimate goal is the development of a translational workforce educated and competent in GCP at CTSA sites, at non-CTSA sites, and in nursing schools so as to improve the quality of clinical research.

2353

Competency-based training program for Research Professionals

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OBJECTIVES/SPECIFIC AIMS: To increase knowledge and application of clinical research coordinator competencies among Research Professionals at the University of Minnesota. METHODS/STUDY POPULATION: The UMN's CTSI developed and piloted a Foundations for Research Professionals training program comprised of: a baseline assessment, 7 online modules, 4 in-person training sessions, video and reading assignments and a post assessment, which totaled 30–35 hours of training and covered the following topics: preparing for a study, study management, participant recruitment and engagement, assessing capacity to consent and the informed consent process. This course also provides valuable resources and connections to online references and materials. The competencies for this program were based on work of the Joint Task Force for Clinical Trial Competency. RESULTS/ANTICIPATED RESULTS: 30 clinical research professionals completed the pilot program and averaged an increase of 6.5% from baseline assessment to post assessment. Participants were asked to rate their confidence on a variety of role-based competencies at the time of preassessments and postassessments. Trends show an increase in confidence for all competency areas after completion of the training program. DISCUSSION/SIGNIFICANCE OF IMPACT: Developing a workforce of competent research professionals is integral to improve the efficiency, quality, and ethics of research. The Foundations for Research Professionals training program increased knowledge of clinical research coordinator competencies. We will assess impact on application of the competencies 6 months after completion of the program. Our next steps include offering the training program as a 2-week session on an ongoing basis for new coordinators at the University of Minnesota.

2376

Best practices for social and behavioral research: Developing a competency-based elearning course in good clinical practice

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OBJECTIVES/SPECIFIC AIMS: Existing GCP training is geared primarily towards researchers conducting drug, device, or biologic clinical trials, and largely ignores the unique needs of researchers conducting social and behavioral clinical trials. The purpose of this project was to develop a comprehensive,

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relevant, interactive, and easy to administer GCP eLearning course for social and behavioral researchers. METHODS/STUDY POPULATION: As part of the ECRPTQ project funded by the National Center for Advancing Translational Sciences (NCATS), a Social and Behavioral Work Group of ~30 experienced social and behavioral investigators and study coordinators was formed to develop GCP training for social and behavioral researchers. Existing GCP training programs were reviewed to identify relevant content that should be included as well as gaps specific to social and behavioral clinical trials where new content would need to be developed. In total, 9 specific modules—Introduction, Research Protocol, Roles and Responsibilities, Informed Consent Communication, Confidentiality/Privacy, Recruitment/Retention, Participant Safety/Adverse Event Reporting, Quality Control/Assurance, and Research Misconduct—were identified by the work group and the content was mapped to competency domains defined by the ECRPTQ project, as well as International Council for Harmonisation (ICH) GCP principles. Several investigators and study coordinators were identified as content experts for each module topic. Working with an instructional designer, these experts defined learning objectives and outlined content relevant for both study coordinators and investigators for inclusion in the modules. The curriculum was developed using Articulate Storyline that is SCORM 1.2 compliant making the course usable to the widest audience. The course was designed to be administered on laptop or desktop computers and is accessible for individuals with hearing or viewing impairments. To maximize learning, instructional designers used creative treatments including: narration to guide learners or offer tips; short video scenarios to introduce topics; interactive activities, such as drag and drop games and "click to learn more information"; knowledge checks with feedback; resources, including downloadable job aids; end of module quizzes, and documentation of course completion. The full curriculum takes 2–4 hours to complete, with individual modules taking 30 minutes to complete. RESULTS/ANTICIPATED RESULTS: Pilot testing to evaluate the effectiveness of the eLearning course is underway at 5 sites: University of Michigan, Boston University, University of Rochester, University of Florida, and SUNY Buffalo. DISCUSSION/SIGNIFICANCE OF IMPACT: This eLearning course provides relevant, comprehensive GCP training specifically for social and behavioral researchers. Unlike existing GCP training that is geared towards drug and device researchers, this course includes scenarios and examples that are relevant to social and behavioral researchers. The engaging, interactive nature of this course is designed to improve learning and retention, resulting in improved job performance. In addition, the modules are designed for both investigators and clinical research coordinators, thus eliminating the need for different training modules for different study team members.

2379

Enhancing the clinical and translational enterprise through research staff development

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OBJECTIVES/SPECIFIC AIMS: Our objectives are to provide opportunities for graduate students, clinical interns, and postdoctoral fellows in traditional training programs to have immersive experiences in clinical research conduct from a CRP perspective. In addition, we aimed to address common causes of job dissatisfaction by providing professional development and networking opportunities for the existing CRP workforce. METHODS/STUDY POPULATION: In collaboration with the CTSA workforce development group, the Duke Office of Clinical Research hosted a site visit for 19 PhD scientists interested in nontraditional career pathways and a short lecture series on project management careers in clinical research. Additionally, we crafted specific clinical research training electives for 20 masters students and 10 dietetic interns. Finally, in collaboration with UNC-CH, we combined Research Professional Networks to provide a pilot joint professional development event for 109 CRPs from both schools. RESULTS/ANTICIPATED RESULTS: The number of Masters students enrolling in the CRP elective grew from 7 students in year 1 to 13 students currently enrolled. A retro-pre/postprogram adapted CRAI survey was issued following program completion. Students self-reported increases in competence across all 24 skills measured. Largest increases were seen in areas specific to CRP roles such as consenting patients, understanding the IRB, and reviewing key study documents. A baseline culture survey issued at the joint Duke/UNC CRP event garnered a 65% response rate and indicated that the principal gaps in professional training are in communications, teamwork, leadership, and professionalism. Moreover, respondents indicated that creating a sense of community and providing networking opportunities were the most important outcomes for future CRP collaborations. Future evaluations of both of these programs will allow us to tailor training to be most effective in strengthening our CRP workforce. DISCUSSION/SIGNIFICANCE OF IMPACT: These initiatives lay the groundwork for the development of a robust training pipeline into CRP careers. Future initiative will apply lessons learned toward creating internship programs aimed at improving diversity and inclusion within these careers. In addition, by addressing the professional development needs of the existing workforce, we create a sustainable environment for well-trained professionals. By evaluating these primary initiatives, we can better define the critical elements that must be included in CRP educational, development, and support programs and subsequently apply these to ultimately improve the clinical and translational research being conducted in academic research settings.

2385

An education program for engineering students collaborating with clinician scientists to address priority hospital patient safety problems using an ethnographic research approach

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OBJECTIVES/SPECIFIC AIMS: Enhancing Patient Safety for hospitalized patients is a priority for healthcare facilities, providers, and federal funding agencies. Multidisciplinary partnerships in clinical and translational research better defines the scope of complex patient-safety issues, and is part of more effectively developing interventions. The discipline represented by engineering-trained partners brings valuable perspective to patient safety problems through their training background in human factors and systems analysis. The objective of this education program was to create and implement a collaboration between engineering students and clinical providers. Through the Johns Hopkins Institute for Clinical and Translational Research, a multidisciplinary partnership was created, to identify contributing factors, and suggest novel solutions, to key patient safety problems using an ethnographic research approach. METHODS/STUDY POPULATION: The collaboration was formed between the following Johns Hopkins (JH) groups: (1) The Institute for Clinical and Translational Research (ICTR), (2) The Armstrong Institute for Patient Safety, (3) The JH Hospital Clinical Engineering Services, (4) The Homecare Group, (5) The Masters of Science in Engineering Management Program at the Whiting School of Engineering, and (6) The JH Hospital Risk Management. All 6 provided representation to contribute to the planning, structure, and implementation of the project. The initial cohort was 24 masters students enrolled in the JHU Whiting School of engineering, and included 46% men, 54% women, and 75% international students. Students were placed in teams of 2–3 to work on 9 distinct patient safety concerns, as provided by the Armstrong Institute as priority. Potential clinical hosts from the appropriate clinical departments were vetted for feasibility and scope before students were assigned to them. Students and clinical hosts were oriented to the process. The students then spent 3–6 hours a week, for 7 weeks, observing and interacting with patients and health professionals at their specific clinical sites, conducting ethnographic research under the guidance of their hosts. Ethnographic research is the systematic investigation of a culture or system; in our application, teams were looking at the environment, culture, and its contributing factors, with respect to patient safety issues. Teams made observations, then formulated hypothesis and collected data relevant to what systems factors may be contributing to the patient safety issue. Following data collection and analyses, teams made recommendations for culture and/or systems shifts that could impact change and improve patient safety. Ethnography research process training is a tenet of the training undertaken by all Masters of Science in Engineering Management Students. RESULTS/ANTICIPATED RESULTS: At the end of the 7-week project, each team generated a comprehensive report suggesting potential solutions for each problem, and gave presentations on their findings to their peers, clinical hosts, and JHU steering committee representatives. Requirements on the student side included a midterm, final presentation, and report. Both students and site leaders submitted mid- and final program evaluations. Based on follow-up survey data, 71% of students said that the course may impact their career choice, 57% said the collaboration changed the way they viewed themselves, and 28% elected to continue working or were planning to work with their site in some fashion after the course ended. Nearly 60% of students believed additional funding or resources would benefit the course and 71% thought they would benefit from more or similar experiences with their clinical partners. Furthermore, 85% wanted to see the course expanded. Of the clinical hosts, 71% said that students added value, 86% believed students changed their perspective on their problem, unveiled new areas of investigation, and improved or likely would improve patient safety in their department. Seventy-one percent of hosts were actively acting on the students' findings, and over 86% shared findings with their colleagues. Following the 7-week program, 2 teams also presented their findings to committees within the hospital departments, 2 patient-safety projects are being continued with engineering teams, and 2 new collaborative projects have been initiated.

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Based on the popularity of this program with the students, hosts, and teaching faculty, this will be implemented within the engineering curriculum for a second time next year. Additional outcomes data collection are currently ongoing, and we plan to continue to monitor and analyze results. DISCUSSION/SIGNIFICANCE OF IMPACT: In its first year our engineering collaboration exceeded expectations. Engineering students and clinical providers successfully worked toward tangible solutions that were directly applicable to patient care. Furthermore, interactions were both personally and professionally beneficial for students while simultaneously adding value to clinical hosts. Beyond the collaboration, this initiative allowed for secondary connections between engineers and clinicians that are also have great potential for resulting in translational innovation. Despite the overwhelming success of this project, it highlighted the need for increased resources for sustainability. Our pilot highlighted a role for funding with regards to: (1) students in the execution of their projects (eg, transportation to sites, prototype materials); (2) clinical hosts, particularly protecting time to interact with and lead student teams; (3) the Armstrong Institute—to aid the identification and prioritization of high impact, patient safety projects; and (4) the ICTR for staff to facilitate placements, student orientation to the hospital setting, and program execution and maintenance. Ultimately, this collaboration addressed an unmet need for the clinical providers as well as the engineering students: thus, all partners agree that (1) the impact of this pilot would be greatly magnified by more time, longer duration, and additional resources; and (2) this collaboration could provide a useful model for approaching other complex health care problems. In terms of larger and longer-term impact, engaging engineers at the training level together with clinicians provides early exposure, and could potentially prime them to continue collaborations with clinical and translational science, across their careers.

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2401

Professional Mentoring Skills to Enhance Diversity (PROMISED): Diversifying the workforce

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OBJECTIVES/SPECIFIC AIMS: To diversify the workforce by providing leadership and career coaching training to mentors so that they can be better leaders with their trainees and incorporate career coaching skills into their mentoring style. METHODS/STUDY POPULATION: PROMISED Program helps current and future members of the National Research Mentoring Network (NRMN) develop management, leadership, and career coaching skills so that they may be more effective in guiding their mentees. Studies show that mentees remain engaged in research when they drive their own careers, but mentors rarely help them recognize ways to do this. PROMISED aims to address by providing online leadership training and career coaching training. We developed innovative online leadership training for mentors committed to mentoring people from diverse backgrounds that are focused on management and leadership skills. These modules contain exercises, self-assessments, and discussion boards. We also have reading materials and other supplemental work such as videos to augment the modules. We also created 2-day training on career coaching skills for mentors. Certified career coaches trained participants in career coaching tools so that they could incorporate these skills into their mentoring style. Mentors tend to view themselves as content advisors, and they focus on the next step in the research project rather than the research career. We trained mentors to provide career coaching to their mentees, which will help the mentee establish a successful biomedical research career trajectory. RESULTS/ANTICIPATED RESULTS: In total, 45 mentors attended the Career Coaching Workshop. We assessed 26 mentoring/career coaching traits. Every trait improved on post survey (Likert scale 1–7), for example, "Taking into account the biases and prejudices you bring to the mentor/mentee relationship" (Pre: 4.16, Post: 5.38) and Working with mentees to set clear expectations of the mentoring relationship (Pre: 4.27, Post: 5.32). Some comments from attendees included: "amazing," "powerful," "excellent program," "learned so much." For the online module, we have a maximum of 20 fellows enrolled in each module. Results show that the fellows rate the module extremely useful. A comment from 1 fellow confirms this: "This session has changed my life and I know that the PROMISED program will transform my abilities as a mentor and as a person." DISCUSSION/SIGNIFICANCE OF IMPACT: Providing Career Coaching Training and Online leadership skills can significantly improve mentors ability to mentor people, particularly those from diverse backgrounds. In addition, this training can help mentors who are committed to mentoring people from diverse backgrounds promote their own careers as well as their mentees.

2419

Clinical research management and regulatory compliance: A graduate distance learning model

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OBJECTIVES/SPECIFIC AIMS: Goal—broaden the academic offer to enhance clinical and translational research productivity and cost effectiveness. Objective—implement a distance learning program on conducting proficient research management. METHODS/STUDY POPULATION: Needs assessment attested students' interest in enrolling and willingness to recruit graduates by the research industry and academia. A master of science in clinical research management and regulatory compliance (MS-CRMRC) was developed using the Core Competency Domains for Clinical Research Professional. Experts from research academia, pharmaceutical industry, composed a Proposal Development Committee. RESULTS/ANTICIPATED RESULTS: Access of a distance learning MS-CRMRC program for students with time constrains. Competent research professional graduates working side by side with the principal investigator on onsite teamwork management, to streamline research processes in compliance to regulations. DISCUSSION/SIGNIFICANCE OF IMPACT: Improvement of clinical and translational research productivity and efficient use of grants funds prevails as a generalized concern. The MS-CRMRC offers an accessible alternative to empower the research enterprise by developing knowledgeable skilled professionals to tackle this need.

2430

Leading diverse and emerging scientists to success (LEADS)

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OBJECTIVES/SPECIFIC AIMS: To diversify the biomedical research workforce by training postdoctoral scholars and junior faculty from 6 Minority Serving Institutions (MSIs) on practical research skills such as Critical and Creative Thinking, Formulating the Problem, Asking the Right Question, Grant Writing, and Team Science METHODS/STUDY POPULATION: In collaboration with our partners, we identified 11 topics where trainees lack research funding. Next, we identified instructors for these topics. We converted the topics to online module with modules ranging from 2 to 8 weeks. In working with an online education expert, we developed innovative online training using Moodle as the content management system. Scholars complete readings, videos, self-assessments and participate in discussion board each week. In addition, we have weekly synchronous sessions for each module. All scholars are required to take the grant writing module and 8 other modules. After each module, trainees complete a brief survey to evaluate the module. The leaders at the MSI participated in an intensive face-to-face training session on how to be a career coach so that they could be career coaches for the LEADS Scholars at their home institutions. RESULTS/ANTICIPATED RESULTS: In the first year, we selected 13 LEADS Scholars. All but 3 scholars elected to take every module. The 3 scholars did not enroll in the Peer Reviewing module. Results of the brief survey at the end of each module indicate that the scholars value each of the modules and rate them very highly. When 1 scholar wanted to leave the program, we decided to have a conference call with all of the LEADS Scholars to determine what was working and what was not working with the program. All scholars recognized the value of LEADS. Some scholars felt that the weekly synchronous session was too demanding as they have competing demands on their time. We consulted with the leadership at the MSI and decided to modify the requirements of the program such that every synchronous call was not required for successful completion of the module and to earn a badge. Scholars need to have at least 9 badges to earn a certificate. In addition to the training, we decided that scholars would also benefit from mock reviews of their grants. This will help them submit successful grants. We learned that the best way to serve the needs of the scholars is to work iteratively with the scholars and leadership to develop a successful program that most effectively meets their needs of the scholars and helps them launch a successful career. DISCUSSION/SIGNIFICANCE OF IMPACT: Postdoctoral scholars and junior faculty from MSI need practical research training to help launch their research career. We suspect that this is true of many institutions and plan to develop these modules so that they can be widely disseminated to other institutions.

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2494

Have interdisciplinary collaborations increased over the last 10 years at Johns Hopkins University? Results of a pilot study

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OBJECTIVES/SPECIFIC AIMS: The purpose of this study is to determine if the prevalence of interdisciplinary collaborations has increased over the past 10 years at 1 CTSA-funded institution. METHODS/STUDY POPULATION: We used Scopus to identify all articles published by authors affiliated with any of the Johns Hopkins Institutions for the years 2005, 2010, and 2015. We limited the search by the Scopus Field Codes "Subject Area" to biomedical science only, "Document Type" to articles only, and "Source Type" to journals only. We further eliminated all articles with 1 author or more than 10 authors. This resulted in 2800 articles for 2005, 3987 for 2010, and 4569 for 2015. After exporting the articles, we randomly selected 25 from each of the 3 time periods. Using the World Public Library Outline of Academic Disciplines as a guide, every author was assigned 1 of the following disciplines: Social Science (eg, Psychology), Basic Science (eg, Biology, Chemistry), Agriculture, Computer Science, Engineering, Medicine, Public Health, Nursing, or an Interdisciplinary field (eg, Genetic Medicine) based on their department and school affiliation. Articles with authors who belonged to 1 discipline only were considered single-discipline articles, and articles with authors in a least 2 different disciplines were considered "interdisciplinary." RESULTS/ANTICIPATED RESULTS: Based on the results of an initial pilot study, in 2005, 24% of articles were interdisciplinary, in 2010, 20% of articles were interdisciplinary, and in 2015, 60% of articles were interdisciplinary. The large gap between the first 2 time periods (2005 and 2010) and the most recent (2015), suggests a possible pattern of increasing growth of interdisciplinary collaborations over time. Expanding this analysis to a much larger sample size will provide additional important evidence. DISCUSSION/SIGNIFICANCE OF IMPACT: Increasing emphasis is being placed on evaluating the effectiveness of the CTSA consortium in achieving its goals and on developing methods to gauge its success. Systematic methods that are easy to replicate across hubs are needed to better understand and track the evolution of scientific collaborations over time. This study outlines a process for determining whether one of the major desirable outcomes of the CTSA, notably the growth of interdisciplinary collaborations, can be determined through the analysis of authorship patterns. Further research is needed to confirm the generalizability of these results across other CTSA hubs.

2511

Use of an online provider learning community to assess clinical HIV/HCV/STDs-related training needs

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OBJECTIVES/SPECIFIC AIMS: The prevention, management, and treatment of HIV, STDs, and HCV requires continuous training that reflects contemporary best-practice and innovative care models. In order to improve the NYS AIDS Institute's comprehensive web-enabled training program, which enhances the capacity of a diverse healthcare workforce, a needs assessment (NA) of our community of practice (CoP) is needed to better understand their training needs, circumstances, and instructional modalities preferences. The goal of the assessment was to better understand our CoP's preferences of online trainings, and as a result to develop a "responsive design" system that will enhance user's learning experience thus improving patient care. METHODS/STUDY POPULATION: We developed and deployed an NA survey using REDCap. The instrument consisted in 27 questions related to providers' preferences on receiving continuing educational training and their use of technologies, including mobile platforms, online modules, webinars, and telehealth. As part of the recruitment strategy, several resources were deployed over a 1-month recruitment period including sequential email blasts, website promotion, and assessment links included in newsletters and social media. Weekly reminders were also used to promote the participation from our CoP. RESULTS/ANTICIPATED RESULTS: A total of 310 respondents participated in the NA, with 85.8% from NYS. 177 were clinicians (20.5% MD, 2.9% PA, 17.3% NP, and 16.3% RN) and 133 nonclinical providers (case/care managers, social workers, public health professionals, coordinators/administrators, and other). The participants worked in hospitals, community health centers, substance use centers, private practices, and state/local health departments. More than 90% of respondents indicated that they preferred both live/in-person and online training, and participants most strongly indicated that they stayed up-to-date on current developments through CDC, the AIDS Institute, and conferences. More than 60% of respondents considered that receiving CE credit for the training was very important and 28% indicated they would use training materials in Spanish if offered. In terms of technology, over 80% of the respondents preferred computers, but more 50% also used mobile devices (computer at home 61.8%, computer at work 85%, tablet 29.9%, iPhone 20.9%, Android 16.6%, other device 2.3%). DISCUSSION/SIGNIFICANCE OF IMPACT: Accessing an online CoP provided a useful opportunity to assess training needs and preferences of clinical and nonclinical providers. Most providers indicated that they were primarily likely to use a work computer to complete online training or secondarily a home computer. With a significant portion of respondents indicating use of tablets, smartphones, and other devices, online training opportunities should be developed with responsive design to assure flexibility and access. In addition to online training, participants indicated that they also strongly valued live, in-person training. Offering training with CDC and the NYS AIDS Institute branding, in Spanish, together with offering continuing education credit, were all seen as desirable training elements. Accessing this online CoP helped streamline and target training priorities and logistics.

2513

Enhancing KL2 Scholar poster communication skills for lay audiences using community judges

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OBJECTIVES/SPECIFIC AIMS: The 2 primary objectives were to (i) insure that Scholars can effectively communicate the translational impact of their research to a lay audience and (ii) assess the benefits and efficacy of having community, as well as faculty members, judge the translational impact of KL2 Scholar's poster presentations. An explicit secondary goal was to further the engagement of community members in CTSI-sponsored translational research. METHODS/STUDY POPULATION: CTSI's Education, Community Engagement, Discovery and Translation, and Translational Workforce Development Cores created the translational impact questions and evaluation sheets. The Community Engagement and Office of Discovery and Translation recruited community judges from their respective networks and they were assigned to relevant studies. Scholars were provided with the judges scoring template in advance. After the Research Poster Session, the KL2 Scholars evaluated the quality of their presentations and the impact of having feedback from Community Judges. The Community Judges evaluated their perceived "added value" to the research presentations and their interactions with the Scholars. Both Scholars and judges completed evaluations of the poster presentation and judging process, performed on a 5-point Likert scale. RESULTS/ANTICIPATED RESULTS: KL2 Scholars felt that the community impact judges provided valuable feedback on their research (3.8/5) and were satisfied overall with the poster session (3.4/5). In evaluating their own presentations, Scholars tended to rate themselves higher (4.2–4.6/5) on the clarity of their translational impact presentations than the community judges rated the Scholars (4.1–4.2/5). Scholars also rated themselves somewhat higher in the quality of their dealing with any ethical issues and their dissemination plan (4.0/5) than the community judges (3.8/5). Judges were very positive and felt they brought value to the experience (4.2–4.4/5). DISCUSSION/SIGNIFICANCE OF IMPACT: Community judges added qualitative value to the Scholar presentations based on the Scholar and community judge evaluations and based on comparison based on prior year poster sessions. Documenting the degree of impact of the combination of this proscribed poster format and community-judging process awaits future assessment of Scholar presentations before and after the next annual poster presentation.

2521

Research participant 101: What you need to know before joining a research study

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OBJECTIVES/SPECIFIC AIMS: The goal of this innovative course is to provide community members with sufficient information to either join or decline participation in clinical research. We anticipate that they will gain knowledge in why research is conducted, the ways participants are recruited, the history of research, regulations that guide research today, participant protections, understand the consent process, their risks and benefits of participating in clinical research. METHODS/STUDY POPULATION: We will recruit interested community members via flyers placed at the training location and at other local community centers and agencies that receive heavy foot traffic.

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The course is listed in the Communiversity catalogue which is distributed in hardcopy (over 30,000) and email each semester. The course will be taught by a longstanding community member and research coordinator at the University of Cincinnati. Each session will be highly interactive including videos, role-play, and discussion of the presented research topics. Evaluation will occur both pre and post-session, along with pre and post-course. RESULTS/ANTICIPATED RESULTS: We anticipate 20–30 participants at each of the 4 sessions. We anticipate that we will learn current perceptions of clinical research and barriers to their participation to enable improved research recruitment. In addition, we will gain new insights into clinical research needs of the community. DISCUSSION/SIGNIFICANCE OF IMPACT: Through these interactive sessions, we will learn why community members participate in research and their barriers to participating. Understanding the perception of research by the target community is critical when developing clinical research recruitment strategies. We will also be developing a more educated community towards clinical research. We will also gain great insight into new clinical research directions as indicated by community members.

2523

Mentor training for KL2 Scholars through vertical integration

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OBJECTIVES/SPECIFIC AIMS: The NIH states, "The training of the biomedical workforce has always been an integral part of the NIH mission… It takes just one good mentor to influence the career of a new investigator; it takes a robust culture of mentorship across the research community to strengthen, sustain and diversify the entire biomedical research enterprise." The University of Minnesota's CTSI-Education core strives to build and maintain a strong culture of mentoring by providing CTSI KL2 scholars an opportunity to mentor an undergraduate student participating in the Pathways to Research Program (PReP). Using this mentoring model, participants gain valuable benefits and CTSI's culture of mentoring is strengthened. METHODS/STUDY POPULATION: Participating KL2 scholars are matched with a promising PReP scholar for a 12-week mentored research project. The PReP program selects top candidates through a highly competitive application process. Students work in their mentor's lab full-time, funded by CTSI-Ed. They engage in additional activities together including a mentor/mentee, an interview activity and 2 social events. Junior faculty scholars are asked to participate as judges at CTSI's Poster Session and are invited to present at PReP seminars. The program culminates with the announcement of the Junior Mentor of the Year, in which scholars nominate their mentors for the award. Junior faculty mentors receive support through a training course, Optimizing the Practice of Mentoring, mentor orientation and a roundtable discussion with the program director and other mentors. The program's infrastructure is designed to foster mentee/mentor relationships through faculty and staff support. Junior faculty receive one-on-one coaching when faced with difficult mentoring situations and are recognized for their mentoring successes. RESULTS/ANTICIPATED RESULTS: Junior faculty mentors highly rate the program on the following points; the experience was a good use of time, I am satisfied with my experience, I would recommend this program to faculty colleagues and students. Undergraduates and Professional students rated their mentoring relationship as 1 of 3 best outcomes of the program. In exit surveys, their highly rated program successes include having a network that helps move their career forward, and confidence to persist through training to become a successful researcher. DISCUSSION/SIGNIFICANCE OF IMPACT: Creating a culture of mentoring is important to the strengthen, sustain and diversify the biomedical research workforce. This mentoring model contributes to the mission while vertically integrating CTSI-Ed's KL2 and PReP programs. On an individual level, junior faculty improve communication and management skills, develop leadership qualities, increase their network, provide a sense of fulfilment and personal growth, and reinforce their own skills and knowledge of subject. They are also provided a top undergraduate student worker fully funded by the program.

2547

Sinai MedMaker Challenge: A model of experiential team science education

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OBJECTIVES/SPECIFIC AIMS: Innovation in healthcare is increasingly dependent on technology and teamwork, requiring effective collaboration among diverse disciplines. However, large knowledge barriers exist between these diverse disciplines which hinders effective communication and the innovation processes. We organized an intensive team-based competition event, Sinai MedMaker Challenge, that engaged individuals with a wide range of backgrounds in medicine, biomedical research, computers science, and engineering to collaborate in solving medical problems with technology-based solutions. The learning objectives were to: enable participants to identify healthcare problems which lend themselves to technology-based solutions; delineate key behaviors critical to multidisciplinary team success; identify optimal strategies for communicating in teams; engage and inspire participants to apply knowledge of technology to meaningfully impact clinical care and well-being. METHODS/STUDY POPULATION: The Sinai MedMaker Challenge was a 48-hour team-based competition, modeled after previously held health "hackathons." Adapting from guidelines provided by MIT Hacking Medicine, the event gathered participants from diverse backgrounds (clinicians, medical students, graduate students in biomedical science and humanities, software developers, engineers, and others), for the purpose of utilizing technology to address pressing problems in the diagnosis, management and/or treatment of pain and/or fatigue. The event flow can be outlined as follows: Phase 1—pre-event brainstorming via Slack and Sparkboard online platforms; Phase 2—problem review with clinical experts; Phase 3—solution pitches, formation of teams, development of prototype solutions; Phase 4—presentations and prizes awarded. The event was sponsored by ISMMS Institutes and Technology Companies. Mentors roamed throughout the event to support the teams in the technical, clinical, and business development aspects of their solutions. RESULTS/ANTICIPATED RESULTS: In total, 78 participants forming 14 teams, worked on the development of software and hardware prototypes (apps/websites, devices, wearables) to address a variety of pain and fatigue problems, culminating in final pitch presentations to a panel of judges comprised of academic experts; innovators and entrepreneurs in the technology start up space. Award recipients were: (1) PT partners, a wearable device for monitoring physical therapy post knee replacement; (2) SickleMeNot, an interactive, multimodal website/app for children designed to assess, monitor and manage pain; and (3) Biolumen, a functional biofeedback system, to treat chronic back pain. Evaluations revealed a high-degree of satisfaction with the event. Several teams continue to develop their prototypes. DISCUSSION/SIGNIFICANCE OF IMPACT: The Sinai MedMaker Challenge (1) was a compelling and productive forum to bring together students, trainees, faculty and other stakeholders to explore tech-based solutions for management, monitoring, and treatment of pain and fatigue; and (2) can be repeated annually, fostering a "Community of Practice," and expanded to offer pre and post event opportunities to encourage iterative learning and ongoing creative output.

ETHICS

2030

"Understandable to the subject": Plain language IRB informed consents

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OBJECTIVES/SPECIFIC AIMS: Develop a plain language informed consent template that met IRB and regulatory requirements. Evaluate the effectiveness of the template at improving the readability of informed consents. Field test the informed consent with low health literacy. METHODS/STUDY POPULATION: We conducted a retrospective analysis of over 200 UAMS IRB approved, investigator initiated informed consents from 2013 to 2015 to determine the readability before intervention. The mean grade level readabilities were derived from the results of 3 readability formulas (Flesch-Kincaid, SMOG, and Fry) using open-source readability tools. A plain language informed consent template that meets IRB and regulatory requirements was developed, adhering to health literacy best practices for written communication. The template was made available to investigators as an optional resource, and IRB committees were trained on use of the template. In addition, a focus group will be conducted to qualitatively assess understandability of the template with study participants identified as having inadequate health literacy. Data analysis will include readability assessment of IRB approved informed consents post intervention with and without use of the plain language template, as well as qualitative feedback from focus group participants. RESULTS/ANTICIPATED RESULTS: The retrospective analysis revealed a mean readability of 10th grade for IRB approved informed consents from 2013 to 2015 (n = 217). The readability of the developed plain language template was 5th grade. Preliminary post-intervention results show adoption of the template by investigators (n = 16)

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resulted in informed consents with a mean readability of 7th grade (range 6–9th grade), compared to a mean of 10th grade (range 7–11th grade) for the comparator ("no adoption" group, n = 24). Data collection will continue through May 2017. The focus group is forthcoming and results will be included in the poster. DISCUSSION/SIGNIFICANCE OF IMPACT: Low health literacy is common in individuals with healthcare disparities and can limit their participation in clinical research. Few studies have examined interventions to address this barrier to research. Preliminary results of this study support the utilization of a plain language informed consent template in investigator-initiated research. Moreover, this study demonstrates the importance of stakeholder engagement among CTSA leadership, health literacy experts, the institutional review board, investigators, and research subjects in the development and testing of this intervention to make informed consents "understandable to the subject" while containing all required elements.

2052

Empirical assessment of a theatrical performance on attitudes and behavior intentions toward research: The informed consent play

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OBJECTIVES/SPECIFIC AIMS: Exposure to theatrical performances holds promise for addressing bioethical issues, but there has been little empirical examination of the impact of dramatic presentation on audiences' attitudes. This study assessed the short-term impact of the play, Informed Consent, on perceptions of trust, willingness to donate biospecimens, attitudes toward harm and privacy among the general public and in faculty, medical and undergraduate students within an academic medical center in the intermountain west. METHODS/STUDY POPULATION: Surveys were administered before and after a staged reading of the play by professional actors. Pre and post survey responses were linked for each participant. Survey items included the short form Trust in Medical Researchers, and single item questions about group identity, of genetic testing in children, and willingness to donate biospecimens. In total, 3 additional questions about harm, consent, and ethical investigator behavior as represented in the play were asked in the post survey. In addition, respondents were given the option to answer open-ended questions through email. RESULTS/ANTICIPATED RESULTS: Out of the 481 who attended the play, 421 completed both the pre and post surveys, and 166 participants completed open-ended questions online ~1 week after the play. Across all participants, there were significant declines for Trust in Medical Researchers and for the survey item "is it ethical for genetic testing in children for adult onset conditions," ($p < 0.001$ for both) following the play. There was a significant increase in agreement to improve group identity protections ($p < 0.001$) and no differences on willingness to donate biospecimens to research ($p = 0.777$). When differences were analyzed by race of the participant, non-White participants (n = 68) compared with White participants (n = 344) were less willing to donate biospecimens in general ($p < 0.001$). Further, non-White participants' willingness to donate biospecimens decreased ($p = 0.049$) after viewing the play while the white participants' willingness to donate was unchanged. Qualitative data provided extensive contextual data supporting these perspectives. DISCUSSION/SIGNIFICANCE OF IMPACT: This is one of the first studies to empirically examine the impact of a theatrical performance on both attitudes and behavioral intentions toward research and clinical research participation. Some attitudes changed following the play performance, but there were no significant differences on intention to donate biospecimens for research overall. Future research can further address the value and impact of theatrical performances and other creative arts as tools to engage the public and investigators in dialogue about the ethical issues and complexities in clinical research and further evaluation of the impact of performances on attitudes about research and ethics. Creative arts may be used to motivate investigators and study participants to confront fundamental questions about research participation and trust.

2084

Knowledge, attitudes, and experiences towards genetic research among persons of African descent

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OBJECTIVES/SPECIFIC AIMS: The purpose of this descriptive study is to explore knowledge, attitudes, and behaviors related to genetics and genetic research in a sample of persons of African descent. METHODS/STUDY POPULATION: Data were generated using a cross-sectional survey design. A nonprobability sample of 272 persons of African descent, ages 18 and older, were recruited from the Washington, DC metropolitan area through public advertisement and word-of-mouth. Participants had diverse backgrounds with most born in the United States (93%), female (71%), some college or above education (57%), household income under $40,000 (54%), and some with a reported disability (38%). Before survey recruitment and administration, this study was reviewed and approved by the Howard University Institutional Review Board. RESULTS/ANTICIPATED RESULTS: The majority (79.8%) of the participants considered themselves as having a "fair" to "good" knowledge of genetics. The sample had a 2.24 (SD = 77) mean score on the 5-item genetics knowledge questionnaire with total possible mean scores ranging from 0 (no correct responses) to 5 (all correct responses). Most (53.3%) participants believe it is important for persons of African descent to participate in genetic research. However, almost one-half (46.7%) felt that information from genetic research can be used to discriminate against minorities. In terms of behaviors, 83.4% of the participants never had genetic testing conducted. However, an overwhelming majority reported that they would be willing to participate in a genetic research project specifically for detection of risk factors such as cancer (87%), diabetes (89.3%), Alzheimer disease (88.6%), and alcohol use disorder (75%). DISCUSSION/SIGNIFICANCE OF IMPACT: This investigation suggests that persons of African descent generally view participation in genetic research as important and are willing to have their genetic profile analyzed to detect susceptibility to certain diseases. However, ethical issues, such as misuse of genetic research to discriminate against minorities, remain a prominent concern. Further studies are needed to illuminate KABEs and to help identify the role these factors may play in this population's willingness to participate in testing and research. Such information could provide invaluable insight to the development and implementation of more ethical and culturally competence strategies for recruiting minority participants into genetic research.

2171

Satisfaction and perceptions of research participants in Clinical and Translational Studies

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OBJECTIVES/SPECIFIC AIMS: The objectives of this study were (1) to examine research participant levels of satisfaction, experiences, and perceptions; and (2) to determine best practices for researchers for engaging research volunteers in clinical trials, and thereby reducing barriers to participation. METHODS/STUDY POPULATION: A self-administered IRB approved survey on satisfaction and perceptions of research participants in clinical and translational studies was developed. The study questions were validated by 5 key informants from each of the 3 research centers who were asked to provide constructive feedback on the clarity and relevance of the questions. The final survey was a 25-item questionnaire that used a Likert scale and focused on 5 domains to reflect satisfaction with "Staff delivery of care," "Environment," "Center Operations," "Study specific questions," and "overall experiences." Questions to reflect participant perceptions were open ended. A convenience sample of all participants currently enrolled in research studies at CTSA institutions (GU, HU, and MHRI) was obtained. In total, 131 participants completed the survey. Of these, 15 were "surrogate" partners. RESULTS/ANTICIPATED RESULTS: Eighty-two (60%) of the participants were African Americans, 40 (29%) were Whites; 94 (67%) were first time study participants. Over 90% of those surveyed strongly agreed that they were "treated well," that their "privacy was respected," and that they "felt comfortable asking questions of the staff." Eighty-four percent indicated they would participate in future studies while over 91% indicated they would recommend a family member or a friend. Only 46% of participants coming for their first research visit strongly agreed that the "compensation received was satisfactory." However, 74% of participants returning for follow-up or who had been enrolled in a previous study felt the compensation was appropriate. Seventy-four percent of those enrolled for the first time indicated "knowing the duration of this study" as compared with only 38% of repeat visitors. When asked what they liked most about participating in a research study their primary responses were "contribution to science" and "knowledge about their diseases." Conversely, when asked what they liked least about the study they responded that the blood draws were uncomfortable and there were often barriers to transportation and parking. DISCUSSION/SIGNIFICANCE OF IMPACT: The results of this survey demonstrated that the majority of research participants rate their experience as highly favorable even among those who had never participated in clinical research previously. In some existing literature, it has been reported that financial compensation was a major

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motivation to participation in studies involving healthy volunteers. In this current study, however, financial compensation did not appear to be the primary motivation for participation. The participants' at all 3 sites stated that the main reason for their participation was the increased knowledge about their disease and the contribution to science. Negative experiences cited were primarily discomfort with blood draw, transportation, and parking logistics. Most importantly, a majority of the participants stated they would participate in future studies and would recommend a family member or a friend for a clinical study. In our sample, there was no difference in the favorable ratings as determined by race/ethnicity. In conclusion, the findings of this study inform the community with regard to how the research participants rate their experiences, and thus motivate others to participate in clinical research. Reasons for participants to withdraw from trials may be associated to their dissatisfaction with a trial or with the study staff. Thus, the degree of satisfaction with the research staff and the trial itself is crucial to reducing drop-out rates and increasing compliance with study procedures. Hence participant satisfaction is key to increasing participation in clinical trials, particularly among African Americans and other racial and ethnic minorities.

2530

Should all clinical research subjects pay the same?

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OBJECTIVES/SPECIFIC AIMS: Discuss ethical and policy issues that will impact clinical research. Raise awareness of the need to understand internal policies at home institutions Encourage further examination of ways to facilitate clinical research participation. METHODS/STUDY POPULATION: Ethical and policy analysis. RESULTS/ANTICIPATED RESULTS: Ideally, clinical research participants should not be required to pay to participate in research. However, if we go with an equity model, as opposed to an equality model, policies should be changed to allow equal access to research participation. This is a matter of justice and also will enhance the quality of the science. DISCUSSION/SIGNIFICANCE OF IMPACT: Unless steps are taken to make participation in clinical research less burdensome financially for participants, research may slow or results may be biased, because only those who can pay will be able to participate.

2533

Beyond "REACH": The Research, Education, And Community Health (REACH) coalition as an exemplar for broad-based stakeholder engagement

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OBJECTIVES/SPECIFIC AIMS: The Institute for Transnational Sciences (ITS) has developed novel methods to ethically engage stakeholders across the transnational research spectrum, up to and including public health practice and policy. METHODS/STUDY POPULATION: In 2014, the ITS co-founded The Research, Education, And Community Health (REACH), the mission of which was to facilitate communication, collaborative research, and service activities between faculty and scientists and area community leaders. The intent was to identify and meet the needs of our communities without gaps and/or redundancies, thus better leveraging time, funding, and efforts. RESULTS/ANTICIPATED RESULTS: REACH now boasts 23 Centers, Departments, and Institutes, as well as 39 community organizations, including public and mental health agencies, clinicians, policy makers, family service centers, cultural and faith-based organizations, business, and local schools/colleges. We offer 3 methods for consideration as best practices: (1) a comprehensive community health needs assessment, (2) an "Offer and Ask" community/campus partnership mechanism, and (3) Community Science Workshops, based on the European Union's Science Shops. DISCUSSION/SIGNIFICANCE OF IMPACT: Results of REACH's work have been used to provide guidance for enhanced, data-driven programs and allocation of resources for local and statewide initiatives. The organization has evolved into an independent coalition seeking 501(c)3 status and is planning to expand its scope to 5 counties. REACH thus serves as model for successful replication across applicable CTSA hubs.

2543

Participatory development of a CTSA-wide Community Advisory Board: Enhancing community engagement at the Michigan Institute for Clinical & Health Research

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OBJECTIVES/SPECIFIC AIMS: To describe how Michigan Institute for Clinical & Health Research (MICHR) has engaged communities in its leadership and governance structure. This presentation will describe these practices, how they are being evaluated, and future plans for institute-wide engagement of communities in translational research. METHODS/STUDY POPULATION: Engaged partners from various communities across Michigan in various ways within MICHR's Community Engagement Program. RESULTS/ANTICIPATED RESULTS: MICHR has utilized participatory practices in the development of the CAB to strengthen existing relationships and build new ones with potential partners. DISCUSSION/SIGNIFICANCE OF IMPACT: MICHR-wide Community Advisory Board (CAB) will ensure community voices are heard and utilized in leadership and strategic decisions for CTSA activities.

MECHANISTIC BASIC TO CLINICAL

2014

Identification of novel shared tumor antigens for the development of T-cell-based immunotherapies

Sherille Bradley and Greg Lizee

OBJECTIVES/SPECIFIC AIMS: The specific objective of this proposal is to identify and validate targetable tumor-associated antigens (TAAs) in ovarian and pancreatic cancer. It is our central hypothesis that the accurate identification and selection of appropriate TAAs will provide a foundation on which to develop of novel and effective cancer immunotherapies. We have formulated this hypothesis on the basis of preliminary results in which we have used high-throughput tandem mass spectrometry (MS) to successfully identify TAAs from melanoma patient tumors. We have subsequently generated TAA-specific T-cells that showed specific recognition and killing of tumor cells, and will form the basis of an upcoming clinical trial for our melanoma patients. We now have extended this antigen identification pipeline into ovarian cancer to accomplish our objective of developing effective T-cell-based immunotherapies for ovarian cancer and pancreatic patients. METHODS/STUDY POPULATION: We have collected patient tumor specimens, and we performed HLA immunoprecipitation, peptide elution, and completed high-throughput tandem MS on these eluted samples to identify TAAs. In addition, we have validated the safety of potential targets through the use of the publicly available RNA sequence data sources GTEX and TCGA. RESULTS/ANTICIPATED RESULTS: To date, we have successfully completed over 60 peptide elutions from ovarian and pancreatic patients samples. In total, we have found several potential novel tumor-associated targets. VGLL1, is one of these identified antigens, and in conjunction with our collaborators, we have successfully generated T-cells against it. Additionally, we have found that VGLL1 is a potential novel TAA for 3 other cancer types, including bladder, gastric, and triple negative breast cancers. We are now focusing our efforts on testing these T-cells against additional ovarian cancer cell lines and these cancer types to determine their specificity. We plan to continue the generation and testing other identified potential TAAs as well. We plan to use these T-cells directly in clinical trials in the future. DISCUSSION/SIGNIFICANCE OF IMPACT: The rationale for this proposal is that through the identification and validation of TAAs, we can open the door to a new world of therapies that can potentially increase the survival rate in a disease with a historically grim prognosis.

2064

Deconstructing the peptide specificity of TCR recognition

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OBJECTIVES/SPECIFIC AIMS: The off-target and organ-specific toxicities observed in cancer immunotherapy present an obstacle to T-cell-based therapeutics. A recent clinical trial underscored the need for improved

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methods to define TCR specificity after melanoma patients treated with TCR engineered T-cells suffered from fatal cardiovascular toxicity arising from the unpredicted recognition of a muscle-specific peptide. METHODS/STUDY POPULATION: To address this drawback to T-cell-based immunotherapies, we developed a novel protein engineering approach to define the peptide specificity of a given TCR. Here, directed evolution in a yeast display system produced a large scale peptide library, where recognition by the melanoma reactive DMF5 TCR acted as the guiding selective pressure. After this technique identified a panel of putative cross reactive peptides, sequence analysis and computational modeling followed by kinetic binding experiments and structural analysis determined the DMF5 TCR recognizes 2 distinct classes of peptides through chemically distinct mechanisms. RESULTS/ANTICIPATED RESULTS: This information led to the rational, structure-based design of additional cross reactive peptides and introduced a unique approach to screen the human proteome and identify the TCR targets which triggered undesired autoimmunity when this molecule was used in clinical trials. DISCUSSION/SIGNIFICANCE OF IMPACT: The distinct chemical nature of the 2 peptide classes suggest TCRs are more cross reactive than previously thought, presenting an obstacle to cell-based immunotherapy. Defining the peptide specificity of TCRs is of high interest to the immunology community, and will lead to improved approaches to designing engineered TCRs for cell therapy.

2074

Comparing the properties of human umbilical cord-derived mesenchymal stromal cells from preterm Versus full-term infants

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OBJECTIVES/SPECIFIC AIMS: To compare functional differences in WJ-MSCs-derived from term Versus preterm infants. METHODS/STUDY POPULATION: WJ-MSCs were enzymatically digested from umbilical cord tissue from Term (gestational age ≥37 wk, n = 4) and Preterm (gestational age ≤32 wk, n = 5) neonates. Cells were characterized by (1) surface antigen markers using flow cytometry, (2) ability to differentiate into adipogenic, chondrogenic, and osteogenic lineages following in vitro stimulation, (3) colony forming unit efficiency, (4) proliferation rates, and (5) cell motility assay. RESULTS/ANTICIPATED RESULTS: WJ-MSCs were successfully isolated from both Preterm and Term groups. Cells adhered to plastic and displayed characteristic spindle-shaped morphology when cultured under standard conditions. WJ-MSCs from both groups expressed surface antigen markers CD73, CD90, and CD146 (≥90%) and did not express hematopoietic markers HLA-DR, CD79, or CD117 (<5%). Preterm and Term cells were capable of differentiating into osteogenic, chondrogenic, and adipogenic lineages. There were no significant differences between the groups when evaluated by colony forming efficiency, proliferation rates, or cell motility. DISCUSSION/SIGNIFICANCE OF IMPACT: These preliminary findings suggest that WJ-MSCs derived from full-term or preterm neonates have similar functional characteristics. Future studies will focus on the regenerative potential of WJ-MSCs from preterm and term infants following changes in the microenvironment (eg, oxygen tension, inflammatory stimulation).

2078

NGF and TNF-α contribute to oral cancer pain by regulating pro-inflammatory cytokines

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OBJECTIVES/SPECIFIC AIMS: We hypothesize that both NGF and TNF-α contribute to oral cancer pain by upregulating pro-nociceptive inflammatory cytokines. METHODS/STUDY POPULATION: In total, 48 oral cancer patients were evaluated and their pain scores were measured using a validated oral cancer pain questionnaire. Presence of perineural invasion (PNI) was identified from patients' pathology reports. We utilized The NIH Cancer Genome Atlas (TCGA) Head and Neck Cancer cohort to investigate the association between pain and genes related to NGF, TNF-α, and their receptors (TRKA, P75, TNF-α receptor 1, and TNF-α receptor 2) in oral cancer samples by employing PNI as a surrogate for pain. Demographic characteristics, clinical characteristics, and genes were analyzed using logistic regression models. A xenograft cancer pain model was created by inoculating human oral cancer cells (HSC-3) into the mouse hind paw. Mice (n = 6 per group) were treated with anti-NGF alone, anti-TNF-α alone, a combination of anti-NGF and anti-TNF-α, or PBS (vehicle control). Nociceptive behaviors were measured using an electronic paw withdrawal assay. Paw volume was measured using a plethysmometer. Cytokines in the paw tissues were measured using a multiplex assay kit with 28 cytokines. RESULTS/ANTICIPATED RESULTS: Oral cancer patients with PNI report significantly more pain compared with patients without PNI in our patient cohort ($p < 0.05$). From analysis of TCGA data, we found that PNI is significantly associated with lymphovascular invasion, pathological nodal invasion, and pathological tumor staging (all $p < 0.05$). In adjusted models, we observed that the NGF receptor p75NTR (NGFR) and the TNF-α receptor 1 (TNFRSF1A) were associated with PNI (both $p < 0.05$) and significantly correlated to each other ($r = 0.25$, $p < 0.001$). High levels of TNF-α were present in HSC-3 cell lines and the mouse xenograft cancers. In mice with cancer pain, combined treatment with anti-NGF and anti-TNF-α together provided more effective pain control compared with either anti-NGF or anti-TNF-α treatment alone ($p < 0.05$). We found significantly increased levels of MIP3a, IL-1b, IL-2, IL-4, IL-28b, IL-23, IL17a, IL-31, and IL-33 in cancer mice compared with normal mice (all $p < 0.05$). The combination therapy significantly reduced cytokines MIP3a, IL-1b, IL-4, IL-28b, IL-31, and IL-33 (all $p < 0.05$). DISCUSSION/SIGNIFICANCE OF IMPACT: We show that targeting both NGF and TNF-α provides more effective pain relief in an oral cancer model. These results suggest that therapeutic strategies aimed at both pathways could yield improved pain management for oral cancer patients.

2080

Therapeutic potential of mesenchymal stromal cells for hypoxic ischemic encephalopathy: A systematic review of preclinical studies

Alvaro Moreira, Jamie Archambault, Dawn McDaniel and Peter Hornsby

OBJECTIVES/SPECIFIC AIMS: To assess the efficacy of exogenous administration of MSCs in animal models of HIE. METHODS/STUDY POPULATION: Adhering to the Systematic Review Protocol for Animal Intervention Studies, a systematic search of English articles was performed using MEDLINE, Web of Science, CINAHL, and Google Scholar. Search term items included mesenchymal stem/stromal cell, hypoxic ischemic encephalopathy, asphyxia, cerebral ischemia, and neonatology. We selected randomized and nonrandomized studies that examined in vivo neonatal models of induced HIE. We excluded studies that combined MSCs with an adjunct therapy. Data were collected on study specifics, MSC characteristics, and outcome measurements. The primary outcome was efficacy of MSC treatment, assessed by functional neurologic measures (cognitive, motor, sensory). Risk of bias was assessed using the SYRCLE's risk of bias tool and we used the ARRIVE guidelines to describe the quality of study reporting. RESULTS/ANTICIPATED RESULTS: A total of 17 preclinical publications focusing on MSC therapy for HIE met our inclusion criteria. Fifteen of the studies (88%) induced HIE in rodents by ligating the common carotid artery followed by a period of hypoxic exposure. Nine (53%) studies derived their MSCs from rodent bone marrow, whereas the other investigators provided xenografts from human bone marrow or umbilical cord-derived MSCs. Range of MSC dose was between 0.25 and 3.5 × 106 cells with 71% of the experiments transplanting the MSCs intranasally or intracerebral. Three studies (18%) administered multiple doses. The cylinder rearing test was the most common (73%) sensorimotor functional outcome performed in the first month following the establishment of HIE. All studies demonstrated a reduction in asymmetrical paw preference after receiving MSC therapy. Lesional size was assessed, using neuroimaging or histologic evaluations, and the majority of studies showed a decreased insult following MSC therapy. DISCUSSION/SIGNIFICANCE OF IMPACT: MSC treatment demonstrates improved functional and structural outcomes that are encouraging for future translational studies.

2081

Phenotypic characterization of the CD4+ T-cell response during anti-CTLA4 therapy with ipilimumab in melanoma patients

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OBJECTIVES/SPECIFIC AIMS: To characterize the CD4+ T-cell response during CTLA-4 blockade immunotherapy with ipilimumab in patients with metastatic melanoma by correlating cytokine profiles with phenotypic changes in the intratumoral lymphocyte compartment of tumor biopsies obtained before and after treatment. METHODS/STUDY POPULATION: Peripheral

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blood mononuclear cell samples were obtained from patients with metastatic melanoma undergoing monotherapy with ipilimumab via the Interdisciplinary Melanoma Cooperative Group at New York University Langone Medical Center. We isolated CD4+ T-cells and used a cytometric bead array assay following in vitro activation with anti-CD3, anti-CD28 antibodies to characterize cytokine expression profiles by quantifying IFN gamma, IL-2, IL-4, IL-6, IL-10, IL-17, and TNF-α at 5 time points during therapy. In total, 53 peripheral blood samples were included from 12 patients. To correlate cytokine profiles with CD4+ T-cell phenotypes in the intratumoral lymphocyte compartment, multiplex immunofluorescence was performed using CD4, CD8, CCR7, CD45RO, and FOXP3 antibodies on tumors before and after treatment with ipilimumab. RESULTS/ANTICIPATED RESULTS: Patients with evidence of clinical benefit (CB), as defined by having achieved partial response or stable disease, were compared with nonresponders (NR). All patients had an increase in IFN-γ, IL-2, and IL-10 secretion by CD4+ T-cells during ipilimumab therapy. NR had a statistically higher increase in all 3 cytokines. Mean IL-10 secretion was 22.3-fold higher compared with patients with CB (p value 0.0458; 95% CI = 0.6676–43.89). Mean IFN-γ secretion was 12.4-fold higher from baseline levels in NR compared with CB (p value 0.046; 95% CI = 0.3589–24.35). Mean IL-2 secretion was 6.9-fold higher in NR compared with CB (p value 0.032; 95% CI = 0.9688–12.75). There were no statistically significant differences seen in the secretion of IL-4, IL-6, IL-17, or TNF-α. Multiplex immunofluorescence for immune profiling of 20 pre and post treatment tumor biopsies is ongoing. We expect to see distinct intratumoral lymphocyte compartment changes which correlate with clinical response and the above described differential cytokine profiles. Specifically, we anticipate CB patients will have increased intratumoral effector T-cells and decreased regulatory T-cells when compared with their NR counterparts. DISCUSSION/SIGNIFICANCE OF IMPACT: Cytokine expression profiles of peripheral blood CD4+ T-cells have not been previously correlated with patient response in patients undergoing treatment with ipilimumab. We describe distinct secretion profiles for IFN-γ, IL-2, and IL-10 for CB Versus NR patients. NR had a statistically higher increase in IL-10, an inhibitory cytokine which typically indicates upregulation of regulatory T-cells and consequent immune escape. Increased secretion of IL-2 and IFN-γ suggests skewing towards a Th1 type, anti-tumor effector T-cell response; these cytokines increased with ipilimumab treatment in both patient groups. However, the mean increase was several fold higher in NR. Recent evidence suggests loss of the interferon gamma pathway in tumor cells confers resistance to anti-CTLA4 therapy. Chronic IFN-γ secretion is associated with an exhausted T-cell phenotype and impaired tumor rejection. Therefore, higher increases in IFN-γ secretion by CD4+ T-cells in NR suggest impaired IFN-γ dependent tumor rejection in these patients. Our findings suggest IFN-γ, IL-2, and IL-10 cytokine expression profiles can be useful as biomarkers for response to ipilimumab treatment.

2092

Chronic branched-chain amino acid ingestion aggravates hilar neuron loss in a rodent model of temporal lobe epilepsy

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OBJECTIVES/SPECIFIC AIMS: We previously developed a translationally relevant model of temporal lobe epilepsy (TLE) in which glutamine synthetase is irreversibility inhibited by methionine sulfoximine (MSO), resulting in spontaneous seizures and dentate hilar neuron loss. The objective of this study was to determine the effects of chronic BCAA ingestion on neuronal viability in the dentate hilus in the MSO model of TLE. METHODS/STUDY POPULATION: Sixteen rats were randomly divided into 2 groups: 8 rats drank a 4% aqueous solution of all 3 BCAAs (BCAA group) ad libitum for 31 days, and the other 8 rats drank regular water (control group) for the same period. After 10 days of drinking, a microinfusion cannula (Alzet osmotic pump, model 2004) was surgically implanted in the right dentate gyrus to continuously infuse MSO at a rate of 0.625 g/hour for 28 days. After 31 days of drinking, rats were perfused transcardially with 0.9% NaCl followed by 4% paraformaldehyde in phosphate buffer. The brains were removed and fixed, sectioned on a Vibratome at 50-μm thickness, and were mounted on a gelatin-coated slides and stained with NeuN. Neuron counts in the hilar region were performed ipsilateral and contralateral to the infusion site using a stereological technique. RESULTS/ANTICIPATED RESULTS: Rats in the BCAA group had 37% fewer neurons in the ipsilateral dentate hilus than the control group ($5.8 \times 10^{-4} \pm 6.8 \times 10^{-5}$ vs. $8.9 \times 10^{-4} \pm 5.6 \times 10^{-5}$ cells, respectively, $p < 0.01$). Similarly, rats in the BCAA group had 39% fewer neurons in the contralateral dentate hilus than the control group ($5.0 \times 10^{-4} \pm 5.8 \times 10^{-5}$ vs. $7.0 \times 10^{-4} \pm 3.4 \times 10^{-5}$ cells, respectively, $p = 0.01$). DISCUSSION/SIGNIFICANCE OF IMPACT: This study demonstrates that chronic ingestion of BCAAs aggravates hilar neuronal loss in a translationally relevant rodent model of MTLE. This study gives important insight into how BCAAs may affect neuronal viability. Although the role of BCAAs on seizure activity is poorly understood, these results suggest that BCAAs may play an important role in neurochemical modulation and neurotoxicity.

2097

Aging-associated increases in platelet granzyme A regulate pro-inflammatory gene synthesis by monocytes

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OBJECTIVES/SPECIFIC AIMS: Platelets govern signal-dependent inflammatory responses by leukocytes. Although dysregulated inflammation is common in older adults, platelet-leukocyte signaling events and downstream inflammatory gene synthesis in aging is not known. METHODS/STUDY POPULATION: Highly-purified platelets and monocytes were isolated from healthy older (age > 60, n = 27) and younger (age < 45, n = 36) adults and incubated together in autologous and nonautologous conditions. Inflammatory gene synthesis by monocytes, basally and in the presence of activated platelets, was examined. Next-generation RNA-sequencing allowed for unbiased profiling of the platelet transcriptome in older and younger adults. Differentially expressed candidates in aged platelets were validated and recombinant granzyme A (in the presence and absence of TLR4 and Caspase-1 inhibition) identified putative ligands controlling inflammatory gene synthesis. RESULTS/ANTICIPATED RESULTS: In unstimulated or activated conditions, monocyte chemoattractant protein 1 (MCP-1) and interleukin-8 (IL-8) synthesis by monocytes alone did not differ between older and younger adults. However, in the presence of autologous activated platelets, monocytes from older adults synthesized significantly greater MCP-1 (867.150 vs. 216.36 ng/mL, $p < 0.0001$) and IL-8 (41.5 vs. 9.2 ng/mL, $p < 0.0001$) than younger adults. Nonautologous, or switch experiments, demonstrated that aged platelets were sufficient for upregulating MCP-1 and IL-8 synthesis by monocytes. Surprisingly, classic platelet proteins known to signal to monocytes and induce MCP-1 synthesis (p-selectin, RANTES, and PF4) were not increased in platelets from older adults. Using RNA-seq followed by validation via RT-PCR and immunoblot, we identified candidate platelet molecules increased in aging that mediate platelet-monocyte signaling and pro-inflammatory gene synthesis. We confirmed that granzyme A (GrmA), a serine protease not previously identified in platelets, is present in human platelets at the mRNA and protein level. GrmA is secreted by activated platelets in signal-dependent fashion. Moreover, GrmA in platelets is significantly increased in aging (~9-fold vs. younger adults). Blocking GrmA inhibited MCP-1 and IL-8 synthesis in older adults. Finally, we uncovered that platelet GrmA signaling to monocytes is regulated through TLR4 and Caspase-1. DISCUSSION/SIGNIFICANCE OF IMPACT: Human aging is associated with reprogramming of the platelet transcriptome. A previously unrecognized protein in platelets, GrmA, is increased in aging and causes increased MCP-1 and IL-8 gene synthesis by target monocytes in a TLR4 and Caspase-1 dependent mechanism. Increased platelet GrmA in aging may contribute to injurious inflammatory responses common in older adults.

2098

Endogenous reverse transcriptase (LINE-1) in human platelets regulates cell morphology and protein synthetic events

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OBJECTIVES/SPECIFIC AIMS: Endogenous RT (eRT) is necessary for the function of retrotransposons, elements that replicate via an RNA intermediate. One source of eRT activity is long interspersed elements (LINE). LINEs, of which there are several subgroups (L1, L2, L3), are retrotransposons that regulate cellular growth and gene expression. Given their diverse and important roles, we hypothesized that L1 elements regulate functional responses in megakaryocytes and platelets; a concept not yet examined in the field. METHODS/STUDY POPULATION: To study eRT in human platelets we used RT activity assays, PCR, and Western blot approaches. Furthermore, we used an RT-inhibitor to dissect the function of eRT, analyzed RT-dependent protein synthetic capacity, and immunoprecipitated RNA-DNA hybrids. RNA-DNA hybrids were also detected by means of ICC and automated analysis using CellProfiler software. RNA-DNA hybrids were validated by PCR and eRT

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regulated synthesis of target proteins was analyzed using autoradiography and Western blot techniques. Platelets from patients with HIV+ were examined in parallel. RESULTS/ANTICIPATED RESULTS: We identified that highly purified, isolated platelets from healthy subjects possess eRT activity. eRT activity was blocked with the non-nucleoside RT inhibitor nevirapine at concentrations within the therapeutic drug range. L1 elements are bicistronic, containing 2 open reading frames (ORFs), ORF1 and ORF2. Thus, we next identified that human platelets express full-length L1 mRNA containing ORF1 and ORF2. In human platelets, eRT activity was localized to L1 protein containing ribonucleo particles. Platelet eRT reverse transcribed exogenous RNAs, a process inhibited by nevirapine, acting in trans using the 3′-UTR of exogenous mRNAs as a template. To dissect the function of eRT in platelets, we next examined cytoskeletal and protein synthetic events in the presence or absence of nevirapine. Inhibition of eRT in isolated platelets led to characteristically beaded platelets in appearance, strongly resembling bone marrow proplatelets. Parallel increases in platelet reactivity were also observed. As these changes occurred over hours, not minutes, we hypothesized that inhibition of eRT would affect platelet protein synthetic events. Consistent with this, RT inhibition resulted in upregulation of global platelet protein synthesis. We validated upregulation of the synthesis of specific proteins (mitofilin, p-selectin, and L26—a component of the 60S ribosomal subunit essential for mRNA translation). RNA-DNA hybrids, noncanonical nucleic acid structures that regulate gene expression, are enriched in regions where L1 is abundant. RNA-DNA hybrids were present in platelets and expression confirmed via differential digestion of RNAs (eg, with RNase A and RNAse I). Next-generation sequencing of pulled down (eg, immunoprecipitated) platelet RNA-DNA hybrids identified numerous differentially expressed transcripts and we focused on MAP1LC3B (LC3B), a primary regulator of autophagy. Hybrid sequencing results for LC3B were validated using qPCR and we confirmed that LC3B RNA binds to L1-encoded RNA binding protein. Platelets treated with nevirapine had increased total LC3B protein expression. As RT inhibition is an important mechanism to control HIV infection, we examined platelet morphology, activation, and LC3B expression in platelets from HIV+ subjects treated with nevirapine. HIV+ patients treated with RT inhibitors had higher numbers of platelets that were beaded in appearance at baseline, increased platelet reactivity, and differential LC3B expression compared with healthy controls. DISCUSSION/SIGNIFICANCE OF IMPACT: Taken together, these results demonstrate that platelets possess eRT activity that regulates platelet morphology, platelet hyperreactivity, and protein synthetic events. We postulate that eRT activity in platelets may be a new post-transcriptional regulatory checkpoint. Moreover, our findings have implications in HIV+ patients treated with RT inhibitors, where off-target effects may contribute to platelet activation and an increased risk of thrombosis.

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The role of estrogen receptor-β in the development of the early endometriotic lesion

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OBJECTIVES/SPECIFIC AIMS: To further elucidate the role of estrogen receptor β (ER-β) in the early endometriotic lesion attachment. METHODS/STUDY POPULATION: EECs were immortalized using a telomerase vector. Immortalized cells and parental cells were characterized by genotyping, and expression of ER-β as well as other epithelial cell markers. ER-β was knocked-down in immortalized EECs using lentivirus-mediated shRNA transduction. ER-β knockdown was confirmed by RT-qPCR and Western analysis. EEC cells with or without ER-β knockdown were used to assess their attachment to PMCs in an established in vitro assay (Lucidi, 2005). Results were analyzed with Student *t*-test. RESULTS/ANTICIPATED RESULTS: Genotyping using karyotype assay confirmed a normal chromosomal profile. Also positive staining for cytokeratin and lack of any staining with vimentin confirms the epithelial origin of these cells. ER-β knockdown has a significant decrease in attachment compared to control ($p = 0.02$). DISCUSSION/SIGNIFICANCE OF IMPACT: Primary and immortalized cells were 46XX, cytokeratin positive, and vimentin negative confirming their epithelial origin. ER-β knockdown has a significant decrease in attachment compared with control.

2136

Gut microbiome alterations in children undergoing hematopoietic stem cell transplantation

Muna Qayed, Dalia Arafat, Samridhi Banskota, John Horan, Edmund Waller and Gregory Gibson

OBJECTIVES/SPECIFIC AIMS: Aim 1: To compare microbiome diversity among patients who develop BSI post hematopoietic stem cell transplantation (HSCT) and patients without BSI. Aim 2: To compare microbiome diversity among patients who develop moderate to severe acute GVHD post HSCT and patients without GVHD. Aim 3: To describe alterations in specific bacterial orders (Enterobacteriaceae, Clostridia, and Lactobacillales) in pediatric patients undergoing HSCT. METHODS/STUDY POPULATION: Next-generation sequencing of the hypervariable V3 region of the 16s rRNA gene isolated from stool specimens collected at baseline (start of preparative regimen to transplant day), early (day 7–14 post HSCT), and late (day 21–28 post HSCT) from 46 children was performed. Microbiome diversity was assessed by the Shannon index as well as UniFrac analysis, and compared among patients with and without GVHD/BSI. Baseline bacterial diversity was compared among patients by primary diagnosis, race, timing of antibiotic introduction and method of supplemental nutrition. RESULTS/ANTICIPATED RESULTS: Median age was 9 years (range 0.5–19.2 years). There were 36 patients with hematologic malignancies. Patients with nonmalignant disease had a characteristic pattern of microbiome diversity (and microbiota order distribution) at baseline that persisted throughout the first month of transplant ($p = 0.004$). Over all patients, there was an early and persistent drop in microbiome diversity throughout the transplant course. Early introduction of broad spectrum antibiotics (prior to transplant day) negatively impacted microbiome diversity ($p = 0.02$). There was no difference in microbiome diversity among patients who developed BSI, when compared with patients without BSI. Similarly, we did not find an association between microbiome diversity and the development of moderate to severe acute GVHD. Ongoing analysis is examining the individual variations in microbiome at the species level, and their relation to transplant characteristics and clinical outcomes. DISCUSSION/SIGNIFICANCE OF IMPACT: In our analysis, microbiome diversity decreased during HSCT, but in contrast to published data, mainly in adult HSCT populations, we found no association between gut microbiome diversity and GVHD or BSI. There are ongoing clinical trials in children and adults using probiotics in HSCT with the aim of decreasing GVHD. Further analysis of our data at the species level may further inform the relationship between gut microbiome alterations and HSCT complications in children and guide clinical interventions.

2139

PBX1 mRNA expression is a prognostic biomarker of and clinical indicator by RT-qPCR and RNAScope® in situ hybridization in neuroblastoma

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OBJECTIVES/SPECIFIC AIMS: (1) Correlate PBX1 mRNA expression as measured by RNAScope in situ hybridization, at an RNA number/cell measurement, Versus by RT-qPCR by the ddCt method. (2) Validate PBX1 mRNA expression in a second independent cohort of neuroblastoma tumor samples, and correlate with patient outcomes. We expect that PBX1 expression will correlate whether detected by RNAScope or by RT-qPCR. This work has the promise of validating a novel biomarker of disease severity, and for clinical translation as the RNAscope technology has been CLIA-certified for clinical use for other genes. METHODS/STUDY POPULATION: Primary neuroblastoma tumor samples were acquired through the Children's Oncology Group Tumor Bank, The Cooperative Human Tissue Network Tumor bank, and the Westmeade Tumor Bank (Westmeade, Australia), with patient outcomes annotated but sequestered until experiments are completed. RT-qPCR is performed using 1 µg total RNA isolated from each sample by Nucleospin RNA kit (Clontech), reverse transcribed by SuperScript VILO (ThermoFisher Scientific) and amplified using KiCqSTART SYBR Green qPCR mix (Sigma Aldrich). RNAScope was performed on sections of fresh frozen tumor, in triplicate, per manufacturer protocol (ACDBio) using company-designed probes. Statistical analyses performed using GraphPad Prism5. RESULTS/ANTICIPATED RESULTS: PBX1 mRNA expression as measured RNAScope correlated well with matched RT-qPCR values, with most PBX1 transcripts identified within the malignant cells and not in tumor stroma. Correlation with patient outcomes is ongoing (expected to be available at the time of presentation), but as the RNAScope values correlate with $R > 0.9$ with RT-qPCR values, we expect good correlation with outcomes in our primary data set and matching validation set. DISCUSSION/SIGNIFICANCE OF IMPACT: PBX1 mRNA expression is an accurate prognostic biomarker of outcome in low and intermediate-risk neuroblastoma, and testing on an additional validation set is planned based on thresholds established by RNAScope. RNAScope is a method readily translatable to clinical use and its inclusion in future clinical trials will be further studied. It provides an additional benefit that concomitant immunohistochemistry can also be performed. Analysis of high-risk neuroblastomas for responsiveness to retinoic acid based on PBX1 expression is planned.

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Association between CYP450 polymorphisms and the use of complementary medicine among patients with drug-resistant epilepsy in Puerto Rico

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OBJECTIVES/SPECIFIC AIMS: Patients with epilepsy often combine their antiepileptic drugs (AEDs) with complementary medicine (CM). They use CM to treat their symptoms of comorbidities disorder, to reduce the side effect of the AEDs or trying to achieve better control of their seizures. However, the inconsistent patters of the use of CM among countries have been attributed to cultural and socio-economic factors and limited studies have explored biological factors. The aim of this study is to determinate whether or not there is an association between having genetic polymorphisms on candidate pharmacogenes for drug-metabolizing enzymes cytochrome P450 (CYP) and the use CM among patients with drug-resistant epilepsy (DRE). METHODS/STUDY POPULATION: In this cross-sectional study, patients will be recruited in the Epilepsy Clinic in the Medical Science Campus of University of Puerto Rico and in private Neurology clinics. To participate in this study, patients need to have both parents of Puerto Rican origin to be defined as Puerto Rican and have a diagnosis of DRE, defined as persistent seizures after at least 2 good trials of the proper drugs at the right dose. After the patient sign, the inform consent, a buccal swap will be collected, and the patient will complete a questionnaire. In the questionnaire, the patient will do a self-report about the use of CM (including natural products, meditation, yoga, and others), frequency of use and socio-economic information. Polymorphisms for CYP 2D6, 2C9, 2C19, or 1A2 will be determined using TaqMan® SNP Genotyping Assays. Data analysis will include descriptive statistical, χ^2 and ANOVA test. RESULTS/ANTICIPATED RESULTS: We expected to determine the frequency distribution of functional polymorphisms on CYPs among patients with DRE who are either using CM and AEDs or standard care (AEDs). Quantified the use of CM and ascertain if there is an association with the CYPs polymorphisms. DISCUSSION/SIGNIFICANCE OF IMPACT: This study is novel, because we will use an objective test, pharmacogenetics approach to rule out biological factors associated with the use of Complementary Medicine by patients' DRE. The study will provide evidence for prospective study using specifics Complementary Medicine guiding by genotyping.

2180

hnRNP K overexpression drives acute myeloid leukemia emergence and progression

Marisa Hornbaker, Miguel Gallardo, Xiaorui Zhang, Huaxian Ma, Peter Hu, Stephen Kornblau, Carlos Bueso-Ramos and Sean Post

OBJECTIVES/SPECIFIC AIMS: Acute myeloid leukemia (AML) is a devastating hematologic malignancy wherein <20% of patients will survive 5 years after diagnosis. In an effort to understand alterations that drive AML development and progression, The Cancer Genome Atlas detailed the most common recurrent mutations. One gene of interest identified here was HNRNPK, supporting our clinical observations that suggest altered expression levels of HNRNPK and its corresponding protein (hnRNP K) may impact AML. Here, we aim to elucidate the impact of hnRNP K overexpression in AML by utilizing AML cell lines and mouse models reflective of the human disease. METHODS/STUDY POPULATION: We utilized fluorescence in situ hybridization (FISH), qRT-PCR, and reverse phase protein array (RPPA) to evaluate HNRNPK copy number and expression levels in AML patient samples compared with CD34+ cells from healthy human donor bone marrow. Kaplan-Meier survival analyses were performed using clinical data from 415 AML patients at MD Anderson Cancer Center and stratified based on hnRNP K protein expression as evaluated by RPPA. To directly evaluate the impact of hnRNP K overexpression in vivo, we created 2 distinct lines of Hnrnpk transgenic mice (HnrnpkTg). Phenotypic differences in the hematologic compartments of these mice were evaluated via flow cytometry, immunohistochemistry, and transplantation assays. Molecular pathways have been evaluated in mice and cell lines using immunoblotting, qRT-PCR, and RNA-immunoprecipitation. The drug JQ1 was used in vitro with both OCI-AML3 cell lines and with primary bone marrow and splenocytes from HnrnpkTg mice. RESULTS/ANTICIPATED RESULTS: FISH analyses demonstrated that a large proportion of AML cases had amplification of HNRNPK that corresponded with upregulation of HNRNPK at the RNA and protein levels. Indeed, patients with high levels of hnRNP K had decreased overall survival compared with those expressing lower hnRNP K levels. In line with these clinical observations, we observed altered myelopoiesis in HnrnpkTg mice. These mice demonstrate increased CD11b+Gr1+ populations in the bone marrow and peripheral blood. Indeed, these mice develop myeloid leukemia, indicated by >20% of circulating white blood cells harboring markers of immature stem cells in conjunction with positive myeloperoxidase staining and blast-appearing morphology. RPPA revealed expression of c-Myc positively correlated with increased hnRNP K levels. In HnrnpkTg mice, c-Myc protein was increased, yet MYC RNA was invariably decreased compared to wildtype. To decipher a mechanism by which this may occur, we demonstrated a post-transcriptional interaction between hnRNP K and c-Myc in vivo. JQ1, a BRD4 inhibitor, that epigenetically decreases c-Myc expression showed preferential activity against myeloid cells expressing high levels of hnRNP K both in vitro and in vivo. DISCUSSION/SIGNIFICANCE OF IMPACT: These preliminary studies demonstrate that hnRNP K overexpression causes myeloid malignancies in both mouse and man. We have determined that c-Myc contributes in part to hnRNP K-mediated leukemogenesis, and that targeting c-Myc may be an effective strategy for hnRNP K-overexpressing AML. We are currently validating other potential targets for interaction with hnRNP K by performing RNA-Seq and hnRNP K immunoprecipitation followed by mass spectrometry. Fortunately, several of our putative targets are druggable—allowing for viable translational outputs to these mechanistic studies.

2188

Implanted multijoint functional electrical stimulation assistance improves walking efficiency after stroke: A case report

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OBJECTIVES/SPECIFIC AIMS: Evaluate the effect of multijoint functional electrical stimulation (FES) on energy consumption during post-stroke walking. METHODS/STUDY POPULATION: A 67-year-old male with chronic stroke was implanted with an 8-channel implanted pulse generator to stimulate flexor and extensor muscles of the hip, knee, and ankle. Oxygen consumption was measured with a k2b4 portable pulmonary gas analyzer during walking with and without FES assistance. Data were analyzed during steady state oxygen consumption within the last 2 minutes of a 5 minute walk. Distance and walking speed were also measured. RESULTS/ANTICIPATED RESULTS: Electrical stimulation increased walking speed from 0.29 to 0.64 minute/second. Faster walking corresponded with increased oxygen consumption from 10.1 to 14.4 mL O_2/kg per minute. Energy cost, consumption as a function of distance, decreased from 3.7 to 2.9 mL O_2/kg per minute walking with stimulation compared with without. DISCUSSION/SIGNIFICANCE OF IMPACT: These preliminary data suggest improvements in walking speed with FES are accompanied by increased energy consumption and decreased energy cost. Oxygen consumption during FES assisted walking was <50% of the peak for able bodied individuals of similar age; patients may successfully use the system for community ambulation.

2193

Targeting MELK in acute lymphoblastic leukemia, new therapeutic approach

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OBJECTIVES/SPECIFIC AIMS: Unlike the high cure rates (90%) of children with acute lymphoblastic leukemia (ALL), that of adults is still lagging behind and better therapies are needed. Maternal embryonic leucine-zipper kinase (MELK) is aberrantly upregulated in cancer, and implicated in cancer stem cell survival. A recent study has identified FOXM1, a MELK substrate, as a therapeutic target in B cell ALL (B-ALL). Thus, we hypothesized that MELK may act as a therapeutic target in ALL via targeting FOXM1 activity. METHODS/STUDY POPULATION: Western blot and qPCR were used to assess MELK expression in 14 ALL cell lines. Knock-down and kinase inhibition approaches targeting MELK expression and function, followed by CCK-8 and Annexin V (flow cytometry) assays to measure cell viability and apoptosis, respectively. RESULTS/ANTICIPATED RESULTS: MELK was significantly upregulated in patients with ALL (oncomine data analysis). MELK was also significantly higher in B-ALL and T-ALL cell lines compared with that in blood cells of healthy donors. MELK knock-down significantly decreased cell viability (40%–70%, $p < 0.05$, Fig. 1) in ALL cells, and induced apoptosis (~40%). OTS167, a potent MELK inhibitor exhibited cytotoxic activities in both B and T-ALL cells. The IC50 of OTS167 ranged from 20 to 60 nM; we also found a significant increase in apoptosis

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($p < 0.05$). Mechanistically, MELK inhibition resulted in decrease of FOXM1 protein levels 3 hours post-treatment. DISCUSSION/SIGNIFICANCE OF IMPACT: MELK is highly expressed in ALL and represents a novel therapeutic target likely via modulating FOXM1 activity. Functional and mechanistic studies will complement and ensure the success of the undergoing Phase I/II clinical trial of OTS167 in patients with refractory or relapsed AML, ALL, and other advanced hematologic malignancies.

2210

Anatomical substrates of cognitive fatigue in aging and in Parkinson's disease

Sarah Elizabeth Burke, Immanuel B. H. Samuel, Qing Zhou, Benzi Kluger, Catherine Price and Mingzhou Ding

OBJECTIVES/SPECIFIC AIMS: Identify objective neurological substrates of cognitive fatigue in Parkinson's disease and in aging. METHODS/STUDY POPULATION: Structural and diffusion MRI. Behavioral assessments for aged adults and Parkinson's disease. RESULTS/ANTICIPATED RESULTS: Gray and white matter deficits that correlate with deficits in the basal ganglia for fatigued Parkinson's disease patients Versus anterior cingulate cortex in healthy aged adults with fatigue. DISCUSSION/SIGNIFICANCE OF IMPACT: Over 50% of patients with Parkison's disease and 38% of healthy older adults suffer from cognitive fatigue. However, diagnostics are limited to subjective surveys and there are no treatments for either population. Therefore, objective measures are greatly needed for better diagnosis and development of treatment targets.

2218

Investigating the correlation between rheumatoid arthritis and *Prevotella copri*

Hannah Fehlner-Peach

OBJECTIVES/SPECIFIC AIMS: Rheumatoid arthritis (RA) is one of the most prevalent systemic autoimmune diseases. It is caused by a combination of genetic and environmental factors. In humans, the intestinal microbe *Prevotella copri* strongly correlates with RA in previously untreated new-onset rheumatoid arthritis (NORA) patients. Metagenomic assembly of *P. copri* from NORA patients and healthy controls suggests genetic differences between *P. copri* from each group. In order to test the hypothesis that genetic differences in *P. copri* from arthritis patients promote arthritis, I am performing genomic comparison of primary *P. copri* isolates from NORA patients and healthy controls, and analysis of the immune response to *P. copri* in mice. Mice colonized with *P. copri* have increased susceptibility to DSS-induced weight loss and death compared with uncolonized controls. Future experiments will assess the local and systemic immune response in *P. copri*-colonized, DSS-treated mice. If this work is successful, then it may be possible to exploit genetic variation in *P. copri*. This could lead to new biomarkers for human disease or even insight into drug metabolism. METHODS/STUDY POPULATION: To validate a strategy to screen for the presence of *P. copri* in feces, qPCR primers were designed to amplify 8 regions across the 3.5 Mb *P. copri* reference genome using NCBI PrimerBlast. Primers were validated with DNA from feces for which *P. copri* abundance was previously determined by 16S rDNA sequencing. *P. copri* genome-specific primers were used to screen bacterial isolates from NORA patients and healthy controls. The 16S V3-V4 region was sequenced and compared with the *P. copri* reference 16S sequence to confirm >97% similarity. Genomes of 2 NORA patient isolates were sequenced on Illumina MiSeq, and sequences were compared with the reference genome. A strategy was developed to colonize mice with *P. copri*: 3-week-old C57BL/6 mice were treated with antibiotics in drinking water for 2 weeks, then switched to water for 2 days before oral gavage with *P. copri*; 6–7 days after inoculation, *P. copri* colonization was assessed by plating feces from inoculated mice, and by qPCR of fecal DNA with *P. copri*-specific primers. A systemic immune response to *P. copri* was assessed by microbe-specific ELISA for IgG and IgA in the sera of colonized mice. RESULTS/ANTICIPATED RESULTS: *P. copri* was detected in the stool of 20% of healthy individuals and 50% of NORA patients. *P. copri* was isolated form 4 healthy individuals and 6 NORA patients. Whole genomes of 96 primary isolates from NORA patients and healthy controls will be sequenced on the Illumina HiSeq platform, and their genomes will be assembled and compared using Spades software. For 2 *P. copri* isolates for a NORA patient, 89% of 250 bp reads aligned >95% to the *P. copri* reference genome. Mice can be colonized with *P. copri* gavaged at >106 CFU. *P. copri*-specific IgG and IgA were detected in the sera of colonized mice. DISCUSSION/SIGNIFICANCE OF IMPACT: Several primary isolates of *P. copri* have been collected from healthy controls and NORA patients, which will enable whole genome comparison of these isolates. For the 2 *P. copri* isolates sequenced, 89% of 250 bp reads aligned >95% to the *P. copri* reference genome, indicating variability between NORA patient *P. copri* strains and the *P. copri* reference genome. The establishment of colonization of mice with *P. copri* will allow further characterization of the immune response to *P. copri* at steady state and under pro-inflammatory conditions. Further, the systemic immune response to *P. copri* indicates that this microbe may have potential to play a role in systemic disease.

2219

Amyotrophic lateral sclerosis, stem cells and TALENted technology

Shaheen Kurani, Nicolas Madigan, Karl Clark, Stephen Ekker, Nathan Staff and Anthony Windebank

OBJECTIVES/SPECIFIC AIMS: The current treatment for amyotrophic lateral sclerosis (ALS) includes systemic delivery of neurotrophic factors (NTFs). Although this approach may seem theoretically sound, NTF efficacy within the central nervous system (CNS) is largely limited by the blood-brain barrier. Thus, a cell-based approach, which allows for targeted delivery of molecular therapies locally from the CNS, could lead to a paradigm shift in the field. METHODS/STUDY POPULATION: The Windebank and Staff group at Mayo Clinic completed a Phase I dose-escalation safety trial of autologous, adipose-derived mesenchymal stem cells (adMSCs) in an effort to move toward personalized medical treatment of ALS. The adMSCs were injected into the intrathecal space by lumbar puncture in 27 patients and the results showed an excellent safety profile across a range of doses. The team is moving forward with this idea by using gene-editing technology to develop clinical-grade, genetically modified autologous MSCs. The patient-derived adMSCs are modified at defined "safe-harbor" regions of the human genome through transcription activator-like effector nuclease (TALEN) technology. RESULTS/ANTICIPATED RESULTS: Our results show that electroporating adMSCs with plasmid DNA leads to efficient GFP or TALEN transgene expression, but yields low cell survival and a low rate of genetic modification. DISCUSSION/SIGNIFICANCE OF IMPACT: It can be concluded that: (1) TALEN technology may be used to target safe harbor loci for gene integration to produce therapeutic adMSC for ALS. (2) Primary barriers to adMSC modification are inefficient TALEN and donor template uptake, low cutting efficiency, and poor cell survival after electroporation. Future directions include optimizing the protocol to obtain 48 base pairs in the homology arms and increasing transfection efficiency.

2249

Gene expression signatures of acute respiratory syncytial virus infection in pediatric patients reveals insight into clinical pathogenesis

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OBJECTIVES/SPECIFIC AIMS: Respiratory viruses cause enormous medical burden, yet many of the specific virus and host genetic factors that impact pathogenesis are still largely unknown or poorly understood. To better understand the drivers of both acute clinical pathogenesis and long-term impacts, such as the development of asthma, we investigated the host response to respiratory syncytial virus (RSV) infections in pediatric patients. METHODS/STUDY POPULATION: We collected nasopharyngeal swabs from 32 pediatric patients with acute RSV infection. The swabs represented a mixed cell population including epithelial and immune cells at the active site of infection. Unbiased RNA sequencing with ribosomal RNA depletion allowed the simultaneous detection of host gene expression and RSV infection. We sequenced samples 2 × 75 bp on an Illumina NextSeq 500. Sequences were mapped to the human genome using the TopHat 2 aligner and FPKM estimation of reference genes and transcripts and assembly of novel transcripts were conducted with Cufflinks 2. RESULTS/ANTICIPATED RESULTS: During acute RSV infection we identified 7343 genes that were significantly expressed. Pathway analysis using KEGG revealed significant upregulation of pathways involved in innate immune response infection, ribosome function, oxidative phosphorylation, spliceosome and autoimmune disorders. We found high levels of innate immune response genes including CXCL8, IFITM1, IFITM2, IFITM3, IL1RN, and ISG15. In comparing RSV subtype A to RSV B we found significant differential expression of multiple noncoding RNAs. DISCUSSION/SIGNIFICANCE OF IMPACT: Examination of the host gene response during acute RSV infections, yielded important insight into the mechanisms that cause clinical pathogenesis and may provide understanding of the mechanisms that lead to known long-term impacts, such as the development of asthma. Together, this data may be used to guide clinical treatment and management decisions for children with severe RSV infections.

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An estrogen receptor α (ERα)-BMPR2-apelin axis mediates 17β-estradiol's protective effects on right ventricular function in experimental pulmonary hypertension (PH)

Andrea Lee Frump, Margie Albrecht, Sandra Breuils-Bonnet, Bakhtiyor Yakubov, Mary Beth Brown, Steeve Provencher, Sebastien Bonnet and Tim Lahm

OBJECTIVES/SPECIFIC AIMS: Women with pulmonary arterial hypertension (PAH) exhibit superior right ventricular (RV) function and survival compared with men, a phenomenon attributed to poorly understood cardioprotective effects of 17β-estradiol (E2). We hypothesize that E2, through ERα, attenuates PH-induced RV dysfunction by upregulating the pro-contractile and pro-angiogenic peptide apelin. This ERα-mediated increase in apelin is mediated by the myocardial remodeling effector bone morphogenetic protein receptor 2 (BMPR2). METHODS/STUDY POPULATION: ERα, BMPR2, and apelin were measured (western blot) in RVs from patients with PAH-induced RV failure and in RV homogenates from male or female Sprague-Dawley rats with sugen/hypoxia (SuHx) or monocrotaline (MCT)-induced PH. H9c2 rat cardiomyoblasts and cardiac endothelial cells were stressed with TNF-α (10 ng/mL) or staurosporine (50 nM) ± E2 (100 nM; 24 h). ERα-, BMPR2-, and apelin-dependence were evaluated by siRNA (5 pM). Downstream apelin target and pro-survival factor ERK1/2 expression was measured (western blot). $p < 0.05$ by ANOVA was considered significant. RESULTS/ANTICIPATED RESULTS: ERα correlated positively with BMPR2 and apelin expression in SuHx-RVs and human RVs. Treatment of SuHx-PH rats with E2 or ERα agonist increased RV BMPR2 and apelin, whereas RV apelin was decreased in E2-treated hypoxic ERα knockout mice ($p < 0.05$), but not in ERβ knockout mice. In H9c2 cells, E2 or ERα agonist attenuated TNF-α- or staurosporine-induced decreases in BMPR2, apelin, and phospho-ERK1/2 ($p < 0.05$ for all endpoints). E2 protection was lost in presence of siRNA directed against ERα, BMPR2, or apelin ($p < 0.05$). ERα was necessary for E2-mediated increases in BMPR2, apelin, and ERK1/2, and BMPR2 was required for the E2-mediated increase in apelin ($p < 0.05$ for siRNA vs. scramble). ERα, BMPR2, and apelin protein was increased in decompensated human RVs but downstream phospho-ERK signaling was disrupted. DISCUSSION/SIGNIFICANCE OF IMPACT: E2, via ERα, increases BMPR2 and apelin in the failing RV and in stressed rat cardiomyoblasts. The E2-mediated increase in apelin is BMPR2-dependent and likely occurs through direct binding of ERα to the BMPR2 promoter. Harnessing this E2-ERα-BMPR2-apelin axis during RV compensation may lead to novel, RV-targeted therapies for PAH patients of either sex.

2257

Vaccine efficacy and immunogenicity of recombinant WAP and CAP-1 proteins in AKR mice

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OBJECTIVES/SPECIFIC AIMS: *Trichuris trichiura*, is a leading cause of chronic colitis worldwide, resulting in growth stunting, anemia, and cognitive deficits, predominately in children. Our long-term goal is to develop a vaccine against *T. trichiura*. Both *T. trichiura* and the closely related *Trichuris muris* release excretory/secretory (ES) macromolecules from the stichosome organ, which facilitates intracellular invasion into the cecum. We exploited the high degree of genetic sequence homology between *T. trichiura* and *T. muris* to evaluate *T. muris* stichosome proteins as vaccine candidates. METHODS/STUDY POPULATION: Through immunological screening of the *T. muris* stichosome cDNA library and *T. muris* ES macromolecules generated in culture, we identified, cloned, and expressed several vaccine candidates. In ranking these antigens, we selected the most promising recombinant proteins, WAP and CAP-1, and vaccinated AKR mice to evaluate the immunogenicity and efficacy of our candidate. In addition, we collected 240 serum samples in the *T. trichiura* endemic region of Honduras to measure the recognition of WAP and CAP-1 in naturally infected human. RESULTS/ANTICIPATED RESULTS: We measured a statistically significant reduction in larval worm burden in WAP and ES vaccinated mice, but not CAP-1, by microscopy and real-time PCR of *T. muris* DNA. We found a significant relationship between antigen-specific IgG1:IgG2a ratio in the mouse serum and degree of protection. Mouse splenocytes, vaccine-sensitized draining lymph nodes, and mesenteric lymph nodes were antigen-stimulated and their secreted Th1, Th2, and Th17 cytokines were measured by Luminex®. Stimulated mouse lymphoid cells were further analysed for T helper, T cytotoxic, and central/effector memory T cells by Flow Cytometry. Human IgG1, IgG2, and IgE antibody titers against WAP and CAP-1 were measured by ELISA. DISCUSSION/SIGNIFICANCE OF IMPACT: In our study, we describe the T cell dependent mechanism of humoral immunity of 2 promising ES-derived vaccines recombinant proteins, WAP and CAP-1. We evaluated the immune response, indicating a driving a Th2-induced humoral response necessary for protection. We further predict protection and allergenicity of WAP in humans using serum from a cohort in an *T. trichiura* endemic region.

2279

The effects of autoimmune inflammation on proliferation, differentiation, and androgen receptor signaling in adult prostate stem cells

Paula Cooper, Hsing-Hui Wang, Meaghan Broman, Hristos Kaimakliotis, Bennett Elzey, Scott Crist, Liang Cheng and Timothy Ratliff

OBJECTIVES/SPECIFIC AIMS: The primary goal of this project is to verify murine findings in the human setting. METHODS/STUDY POPULATION: The methods include primary cell isolation and culture, FACS, adoptive transfer, 3D-cell culture, histology, immunofluorescence, xenograft, and tissue recombination. The study population includes patients undergoing radical prostatectomy due to hyperplasia or adjacent bladder or prostate cancer. RESULTS/ANTICIPATED RESULTS: Having verified similar sensitivities to androgen receptor (AR) inhibitors between naive murine and human basal prostate stem cells, we anticipate that autoimmune inflammation in humans affects the response of basal prostate stem cells in a manner similar to the murine setting as well. This includes increased proliferation, differentiation, and response to AR inhibitors. DISCUSSION/SIGNIFICANCE OF IMPACT: The identification of survival mechanisms used by basal prostate stem cells in an androgen deprived environment may give insight to the process by which prostate cancer becomes androgen independent. The effect of inflammation on proliferation, survival, and AR signaling in these cells may also provide information relevant to cancer initiation and progression.

2281

Temperature regulating wheelchair cushion for prevention of pressure ulcers

Metin Yavuz, Ali Ersen and Linda Adams

OBJECTIVES/SPECIFIC AIMS: According to the US census, there are 3.3 million Americans who have to use wheelchairs in order to maintain their mobility. About 50% of these patients develop a pressure ulcer at some point during their life time. Three major factors contribute to pressure ulceration; pressure, tissue temperature, and maceration due to sweating. The objective of this study is to develop a temperature regulating wheelchair cushion in order to address elevated tissue temperatures and related sweating. METHODS/STUDY POPULATION: We instrumented a wheelchair with cooling elements, a water filled cushion and a pump. The pump moves the water through the cooling elements where water temperature drops down to 15°C. The water then moves to the cushion where it cools the tissue and then back to the cooling elements. RESULTS/ANTICIPATED RESULTS: We recruited 1 healthy subject to sit on the instrumented wheelchair and then obtained thermographs of the cushion surface using an infrared thermal camera. After 1 minute of sitting on the cushion the minimum temperature was recorded as 27°C. After 10 minutes the temperature dropped to 23.3°C. DISCUSSION/SIGNIFICANCE OF IMPACT: In this ongoing proof-of-concept study we are investigating if circulating chilled water inside a wheelchair cushion is a feasible method to regulate tissue temperatures at the 25–28°C range. This range has been shown to delay ulceration under loading conditions that simulate sitting on a wheelchair. Initial results indicate that this may be an effective ulcer prevention method.

2297

Dietary fat stimulates growth of pancreatic cancer growth through the cholecystokinin receptor

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OBJECTIVES/SPECIFIC AIMS: Epidemiologic studies have found that the incidence of pancreatic cancer is greatest in countries that consume diets high

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in fat. The gastrointestinal peptide cholecystokinin (CCK) is released from the duodenum in response to dietary fat. CCK has also been shown to stimulate growth of pancreatic cancer through the CCK receptor that is over-expressed on pancreatic cancer cells. The aim of this investigation was to determine if dietary fat promotes growth of pancreatic cancer through the actions of CCK at its receptor. METHODS/STUDY POPULATION: The effects of dietary fat on growth of murine Panc02 pancreatic cancer xenografts were studied in 3 different systems with immune competent mice: (1) pharmacologic blockade with a CCK receptor antagonist, (2) genetic knockout of the CCK receptor by CRISPR, and (3) in genetically engineered mice lacking the CCK peptide (CCK-KO). After injection of 2 × 106 Panc02 cells subcutaneously, mice were fed either a high-fat diet or a control diet for 37–42 days. Tumor volumes and weights were measured and histology performed. RESULTS/ANTICIPATED RESULTS: Dietary fat significantly increased the size of pancreatic cancer xenografts and this effect was reversed by CCK receptor blockade. Receptor antagonist therapy also significantly reduced tumor-associated fibrosis and increased the influx of CD8+ lymphocytes in the micro-environment. Panc02 cancer cells lacking CCK receptors failed to respond exogenous administration of CCK in vitro and to dietary fat in vivo. Dietary fat did not stimulate Panc02 tumor growth in CCK-KO mice. DISCUSSION/SIGNIFICANCE OF IMPACT: The mechanism by which dietary fat stimulates growth of pancreatic cancer is by CCK and this effect is independent of obesity. This is a significant finding because of the potential beneficial effects of medications which can block the effects of CCK in populations at risk for pancreatic cancer consuming a high-fat diet.

2298

Allergic asthma is associated with elevated sphingolipid levels in children

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OBJECTIVES/SPECIFIC AIMS: To determine if altered sphingolipid metabolism and composition are associated with childhood-onset asthma. METHODS/STUDY POPULATION: Sphingolipid profiles and composition were analyzed in a pilot cohort of pediatric with asthma (n = 22), and in nonasthmatic controls (n = 17). The cohort includes males and females, ages 5–17 years with no prior history of asthma or wheezing, and those who have been previously diagnosed with asthma by a pediatric pulmonologist. Subjects who have a history of prematurity, chronic lung disease, acute respiratory infection, malignancy, autoimmune disorders, immunodeficiency, or sickle cell anemia were excluded. Asthma and nonasthma phenotypes were determined through clinical history, standardized asthma symptom checklists, medical record review and spirometry. Masses of sphingolipids were quantified by mass spectrometry (HPLC-MS/MS) in serum and exhaled breath condensates (EBC). Allergy status was determined through clinical questionnaire, blood IgE (>150 IU/mL) and blood eosinophils (>0.3 × 103/mcl). RESULTS/ANTICIPATED RESULTS: Multiple species of sphingolipids and ceramides were found to be higher in the serum and EBC of asthmatics compared with controls in the overall cohort. In serum, these species include C16 ($p = 0.05$), C16DH ($p = 0.05$), C18:1DH ($p = 0.002$), C20 ($p = 0.05$), Sphingosine ($p = 0.05$), and S1P ($p = 0.04$). In EBC, asthma was associated with higher levels of C18:1DH ($p = 0.05$), C20 ($p = 0.05$), C22 ($p = 0.05$), Sphinganine ($p = 0.05$), Sphingosine ($p = 0.04$), and S1P ($p = 0.06$). When data were stratified for allergic status, the increases in serum sphingolipids were largely associated with total IgE levels greater than 150 IU/mL. Sphingolipids which were increased in allergic asthma (n = 13) compared with allergic controls (n = 5) included C16 ($p = 0.006$), C16DH ($p = 0.006$), C18:1DH ($p = 0.06$), C20 ($p = 0.048$), C22 ($p = 0.02$), C24 ($p = 0.02$), C24:1 ($p = 0.02$), Sphinganine ($p = 0.02$), Sphingosine ($p = 0.01$), and S1P ($p = 0.02$). Notably, only C18:1DH remained increased in asthmatics regardless of allergic status, in both low and high total IgE subjects. DISCUSSION/SIGNIFICANCE OF IMPACT: Data from this pilot cohort suggest that sphingolipids are altered in asthmatic compared with nonasthmatic children, particularly in association with a history of allergy and elevated blood IgE. This trend was also demonstrated in exhaled breath condensate, suggesting that sphingolipids are altered both in serum and airway fluid. Only 1 species of sphingolipid measured, C18:1DH, was elevated in asthmatics regardless of allergic status. Notably, this sphingolipid was recently identified to be associated with exercise induced wheezing (EIW) and asthma persistence overtime, in a large case-control study of children with and without asthma (Perzanowski *et al.*, in press). EIW has been identified as a specific phenotype of asthma, and can be present with or without allergy/atopy. Taken together, these data suggest that altered sphingolipids may contribute towards the underlying pathophysiology of asthma, the understanding of which can lead to improved characterization of asthma phenotypes.

Reference

Perzanowski M, *et al*. Distinct serum sphingolipid profiles among school-age children with exercise-induced wheeze and asthma persistence. *American Journal of Respiratory and Critical Care Medicine* 2017 (in press).

2299

Targeted eccentric motor control to improve locomotion after incomplete spinal cord injury

Kevin O'Brien, Michele Basso and James Schmiedeler

OBJECTIVES/SPECIFIC AIMS: Incomplete spinal cord injury (iSCI) is a life-long disability that typically results in a profound loss of locomotion capability. Current rehabilitation methods rarely restore full community ambulation, which in turn limits quality of life. Most individuals with iSCI exhibit persistent deficits in eccentric muscle control and reach recovery plateaus below the levels necessary for independent community ambulation. Eccentric motor control is essential during the weight acceptance phase of gait, which is emphasized during downhill walking. METHODS/STUDY POPULATION: The overground locomotion of subjects with chronic iSCI was analyzed both prior to and following a 12-week downhill body-weight-supported treadmill training regimen and compared to that of matched healthy controls in terms of kinematics, kinetics, and EMG activation. RESULTS/ANTICIPATED RESULTS: We expect to find significant differences between the controls and subjects with iSCI, with deficits in eccentric motor control accounting for some of these differences. In addition, we expect the downhill training to yield significant improvement in eccentric muscle control that translates into improvements in functional, overground walking for the subjects with iSCI. DISCUSSION/SIGNIFICANCE OF IMPACT: The goal is to determine if downhill training can improve eccentric motor control and extend recovery beyond established plateaus. OpenSim modeling of the experimental data will help quantify changes in eccentric control of individual muscles to clarify where specific gains are made.

2325

Steroid therapy limits stem cell activation required to enact mucosal healing in inflammatory bowel disease

Evan Brady Lynch, Tatiana Goretsky, Emily Bradford, Tianyan Gao and Terrence Barrett

OBJECTIVES/SPECIFIC AIMS: Intestinal stem cells (ISC) primarily act in the repair of ulcerated epithelium, and their proliferative capacity relies on Wnt/β-catenin signaling. However, the role of GCs on basal epithelial cell signaling has not been fully characterized. The objective of this study was to interrogate a mechanism by which steroids may limit ISC activation. GCs inhibit NFκB signaling, which has been shown to play a role in nuclear β-catenin activation in epithelial cells. We hypothesized that GCs limit Wnt/β-catenin signaling required for ISC activation and epithelial restitution by inhibiting NFκB activation in epithelial cells. METHODS/STUDY POPULATION: To examine the effects of GCs on intestinal epithelial cells, we treated a nontransformed human colonic epithelial cell line (NCM460) with dexamethasone and observed the effects on NFκB and Wnt/β-catenin signaling events. We isolated mouse epithelial cells from the distal colon for stem cell culture as 3D "organoids." We obtained pure epithelial cell preparations from mucosal biopsies isolated from patients treated at GI clinics at the University of Kentucky Chandler Hospital and VA Medical Center, Lexington. Steroid treated patients with equivalent levels of inflammation, but no mucosal ulceration were used as controls. RESULTS/ANTICIPATED RESULTS: In steroid-treated NCM460 cells, we saw an increase in steroid-responsive genes GILZ and SGK1. We saw a significant decrease in transcripts for Wnt target genes, including Axin2 and cmyc; NFκB target genes, including IFNG and IL6; and the shared NFκB and Wnt pathway co-activator CREBBP, despite unchanged transcript levels for β-catenin (CTNNB1). This data was corroborated in 3D stem cell cultures from cells isolated from mouse colon tissue, which had significant decreases in transcripts for stem cell markers Lgr5 and Ascl2, proliferative markers KI67 and PCNA, and Wnt target Axin2. NCM460s transfected with a lentivirus carrying a TCF/LEF luciferase construct showed a 2.5-fold decrease in TNF-stimulated luciferase activity with dexamethasone treatment. Interestingly, this effect can be rescued by glucocorticoid receptor (GR) blockade with RU-486. Intestinal epithelial cells from patient biopsies showed significant decreases in colitis-induced Axin2, p-LRP6 (a positive marker of Wnt Signaling) and nuclear β-catenin, which correlated with decreased p-p65 protein levels. DISCUSSION/SIGNIFICANCE OF IMPACT: Together, these data suggest that steroid therapy inhibits Wnt/β-catenin signaling at multiple levels, and effects stem cell proliferation in pure stem cell cultures. Decreases in TCF/LEF transcriptional activation (nuclear β-catenin's DNA binding target) can be reversed with steroid receptor blockade with RU-486, suggesting that a receptor level interaction may be occurring. Interestingly, the required co-activator CBP, shared between NFκB and Wnt pathways, has decreased transcription following steroid treatment, which may provide a mechanism for limited Wnt

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activation following steroid therapy. Although steroids play a significant role in regulating the amount of inflammatory damage that occurs during IBD treatment, our data suggest that they may be limiting pathways required for effective healing as well.

2326

Successful hand function recovery after stroke

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OBJECTIVES/SPECIFIC AIMS: Upper-extremity (UE) impairment affects 88% of stroke survivors due to dysfunctional shoulder-hand coordination. Patients may be able to grasp with the arm at rest, but unable to grasp in a functional context (eg, from a high shelf) because shoulder use elicits involuntary hand muscle activity. Further, much rehabilitation research is directed at unsuccessful stroke recovery (patients with persistent UE impairment) but very little towards patients who show successful clinical recovery (such as those with mild UE impairment) even though these patients have attained the desired rehabilitation outcome. We examined the neurophysiological trajectory of successful compared to unsuccessful post-stroke recovery in the context of functional UE movements to clearly identify what factors are necessary for successful recovery of functional UE movements after stroke. METHODS/STUDY POPULATION: We studied 3 populations: (1) mildly-impaired patients, early (at <17 d, 30 d, 90 d, and 180 d) after stroke as a model of successful post-stroke recovery, (2) moderately-impaired, chronic patients (>6-months post stroke) with persistent hand function impairment, as a model of incomplete post-stroke recovery (unsuccessful recovery), and (3) Healthy age-range matched controls. We used transcranial magnetic stimulation (TMS) in all 3 groups at the given time points to measure corticomotor excitability (motor evoked potentials, recruitment curve), corticomotor inhibition (short-interval intracortical inhibition, long-interval intracortical inhibition), and intracortical facilitation of hand muscles with the shoulder positioned in different degrees of flexion or abduction (these shoulder positions are known to elicit involuntary, undesired hand muscle activation, which leads to UE dysfunction and impairment in individuals with stroke). RESULTS/ANTICIPATED RESULTS: Data collection are in process and will be presented. Preliminary data from controls shows that corticomotor excitability of selected hand muscles is affected by changes in shoulder position. Preliminary findings in controls are consistent with clinical findings in stroke that certain shoulder positions elicit involuntary and undesired hand muscle activation, leading to UE dysfunction and disability. Findings from the stroke groups will be presented. DISCUSSION/SIGNIFICANCE OF IMPACT: We hypothesize that this centrally-facilitated coupling between shoulder and hand muscles is disrupted after stroke, which may play a central role in the inability of patients to perform functional UE movements. By comparing the TMS metrics in mildly-impaired Versus moderately-impaired chronic patients, we will be able to identify the longitudinal change in neurophysiology underlying shoulder-hand coordination that is associated with successful or unsuccessful clinical recovery of UE function after stroke. Thus, these findings will help us distinguish between the neurophysiology underlying successful from unsuccessful UE recovery leading to more mechanism-based interventions for UE dysfunction post stroke in the future.

2343

Enumeration of circulating tumor cells for monitoring cancer treatment response

Jose Ignacio Varillas, Jinling Zhang, Weian Sheng, Kangfu Chen, Isis Barnes, Thomas George, Chen Liu and Hugh Fan

OBJECTIVES/SPECIFIC AIMS: The goal of this research is to use circulating tumor cells (CTC) enumeration and characterization to monitor anticancer treatment response. Emerging evidence strongly suggests the implications that epithelial-to-mesenchymal transition may have in cancer metastasis. Consequently, we hope to elucidate the significance of mesenchymal and stem-like CTCs in the peripheral blood of metastatic pancreatic cancer patients by analyzing the prevalence and frequency trends of CD133 + CTCs, as they relate to clinical events. We also hope to determine if there is a correlation between EpCAM + CTCs and CD133 + CTCs numbers with tumor size, disease stage, and patient clinical outcome. METHODS/STUDY POPULATION: Blood samples of patients with metastatic pancreatic cancer (stage IV) were obtained from the University of Florida Health Cancer Center after informed consent through an IRB-approved protocol. CTC capture, characterization, and enumeration was performed on the blood of these cancer patients during their anticancer treatment. Patients had blood drawn for this purpose at time points aligned with clinical phlebotomy (every 2 weeks). CTC capture was performed by introducing treated patient blood samples into antibody-functionalized microdevices. The PDMS devices were functionalized by immobilizing either anti-EpCAM or anti-CD133, through an avidin-biotin complex. After capture, cells were fixated and permeabilized with 4% paraformaldehyde and 0.2% Triton X-100, respectively. Three-color immunocytochemistry (anti-cytokeratin-FITC, anti-CD45-PE, and DAPI) was performed to identify CTCs from nonspecifically captured blood cells. To be counted as a CTC, based on the FDA-approved technical definition, a cell with the appropriate cell size and morphology must be nucleated (DAPI+), express cytokeratin (CK+), and lack the leukocytic CD45 marker (CD45−). RESULTS/ANTICIPATED RESULTS: We tested the clinical utility of the device for monitoring the response of patients with advanced pancreatic cancer to a chemotherapy treatment consisting of anticancer drugs including 5-fluorouracil, leucovorin, oxaliplatin, and dasatinib. We have detected EpCAM + CTCs in 47/47 (100%) and CD133 + CTCs in 41/47 (87.2%) of blood samples, coming from a cohort of 16 patients. We studied the correlation between the CTC numbers and the clinical result of patients in the study. We found that the size and changes in the size of the primary tumor (confirmed by CT scans) correlated with the frequency and increase/decrease trends in the number of CTCs detected. We expect to find some relationship between the number of detected CD133 + CTCs, or rather stem-like CTCs, and the clinical outcome of patients (eg, disease progression leading to withdrawal from study). DISCUSSION/SIGNIFICANCE OF IMPACT: Enumeration of patient CTCs and stem-like CTCs at different stages of a patient's treatment may correlate with disease stage and prognosis, and prove useful in monitoring early recurrence, patient-specific treatment response, and newly acquired resistances; all of which would aid in providing guidance for the next step in clinical intervention. This type of liquid biopsy technology has great potential to make an impact in the future of personalized medicine and point-of-care diagnostics, as well as become a sturdy tool for translational research.

2367

Defining critical features of the immune microenvironment in melanoma using multiplex immunohistochemistry and spatial analysis

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OBJECTIVES/SPECIFIC AIMS: Precise biomarkers are urgently needed to characterize the tumor immune microenvironment in primary melanoma tumors both for prognostication and to predict the benefit of immunotherapeutic intervention. The goal of this work is to define spatial relationships between CD8 + T cells, CD68 + macrophages and Sox10 + melanoma cells in order to define features correlating with prolonged survival METHODS/STUDY POPULATION: Five micrometer slides from either the primary biopsy or subsequent wide local excision procedure were stained using Opal multiplex IHC for DAPI, CD3 (LN10, Leica), CD8 (4B11, Leica), CD68 (KP1, Biogenex), SOX10 (BC34, Biocare), HLA-DR (LN-3, Abcam), and Ki67 (MIB1, Abcam). Cell phenotypes within representative fields preselected by a trained dermatopathologist and were visualized using the Mantra quantitative pathology workstation (PerkinElmer), and analysis of spatial distribution of CD3+ CD8+ cells analyzed using inForm® image analysis software (PerkinElmer), and Spotfire software (TIBCO). In order to test whether mIHC can better characterize the tumor immune microenvironment, we screened databases at the Herbert Irving Cancer Center (HICC) at Columbia University for stage II/III melanoma patients diagnosed between 2000 and 2012, with available FFPE of primary melanoma tissue and documented clinical follow-up. We identified a preliminary population of 57 patients to begin our analysis. Clinical follow-up was available on 35 patients of whom 21 patients were alive with no evidence of recurrence or died with no evidence of recurrence and 14 had died of melanoma. Twenty-four patients had more than 24 months of survival information available but no detailed clinical information to determine cause of death. RESULTS/ANTICIPATED RESULTS: First, we evaluated whether density of immune cells in tumor and stroma predicted prognosis in 35 patients with disease specific survival information. We find that high number of CD3 + CD8 + cells in tumor correlates with Disease Specific Survival (DSS) ($p = 0.0323$*) and CD3 + CD8 + cells in stroma may also correlate with DSS ($p = 0.0671$). This is consistent with what is known in the literature regarding tumor infiltrating lymphocytes (TILs). We also found that CD68 + cells in stroma predict poor prognosis (0.0259*). This is consist with the proposed

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deleterious role for macrophages in tumor progression. Next, using nearest neighbor analysis we examined the effect of HLA-DR and Ki67 expression on spatial distribution of CD3+ CD8+ T cells. We find that CD8+ T cells are closer to myeloid (CD68+) cells expressing HLA-DR. This is consistent with the potential of HLA-DR expressing cells to present antigens to T cells, and suggests that T cells may preferentially interact with HLA-DR expressing myeloid cells. Conversely, we find that Ki67 expression on tumor (SOX10+) cells correlates with increased distance from CD3+ CD8+ T cells relative to SOX10+ Ki67- tumor cells. This finding is consistent with the observation that more advanced tumors with higher mitotic rates have decreased T cell infiltrates, and suggests that dividing melanoma cells are less likely to interact with T cells. In addition, we performed analysis to determine whether spatial relationships defined above impact prognosis. Clinical oncology follow-up was available on 35 of the 57 patients evaluated above. We compared proximity of CD3+ CD8+ cells to both myeloid (CD68+) and tumor (SOX10+) cells in patients who recurred and those with no evidence of recurrence. We found that CD3+ CD8+ cells in patients who had recurrence were closer to CD68+ HLA-DR− cells than in patients who had no recurrence (*t*-test, $p = 0.0377$), this correlated with DSS ($p = 0.003$). Conversely, distance from CD3+ CD8+ to CD68+ HLA-DR+ in relationship to recurrence was not significant with a trend towards CD3+ CD8+ T cells being closer in nonrecurrent patients (*t*-test, $p = 0.1362$). DISCUSSION/SIGNIFICANCE OF IMPACT: Consistent with the literature, we find that densities of CD8+ T cells correlates with favorable outcomes in early stage melanoma. We also find that density of CD68+ macrophages in stroma correlates with poor outcome. If proximity is a surrogate for interaction, these data indicate that dividing, Ki67+, melanoma cells interact less with CD8+ T cells than do Ki67+ melanoma cells. Further, HLA-DR expression on CD68+ infiltrating cells likely enhances their interaction with T cells. Interestingly, on further analysis, CD3+ CD8+ cells were significantly closer to CD68+ HLA-DR− cells in patients who recurred, implying that interactions between these cell types may not be favorable. This analysis demonstrates that spatial analysis may be useful in predicting prognosis in early stage melanoma, and this is the first report of this type of analysis predicting outcomes in primary tumor specimens to our knowledge. Further staining and analysis of the complete patient cohort (n = 120) is ongoing.

2370

Understanding epicardial fat biology by imaging

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OBJECTIVES/SPECIFIC AIMS: The goal is to understand the underlying mechanism of epicaridial fat biology and its response to cardiometabolic disease by using quantitative multi-echo Dixon (mDixon) of water and lipid sequence, T2* blood-oxygen-level-dependent (BOLD) sequence of iron content, and data analysis methods to determine the quantity of brown Versus white fat. To accomplish this goal, we propose to define the histological, genetic, and metabolite state of epicardial fat and to confirm the relationship between fat phenotype and magnetic resonance (MR) characteristics. We will then investigate whether MR is more effective in identifying patients with lower cardiovascular disease risk than computed tomography (CT). METHODS/STUDY POPULATION: We will recruit 100 patients undergoing open-heart surgery and will quantify mDixon (proton density fat fraction), BOLD (T2*), and T2/T1 maps of epicardial, extrapericardial, and subcutaneous fat before their surgery. We will then (a) validate MR findings by direct depot-specific tissue analysis for lipid content, histological, and genetic markers of inflammation and brown and white fat, (b) develop plasma and fat depot specific metabolite profiling of cardiovascular disease risk and correlate with imaging characteristics. We will categorize cardiovascular risk score (Cardiovascular Health Status) of our 100 patients on quartiles. We will then build models where the categorized cardiovascular risk score are regressed on MR measures (epicardial fat fraction, T2*, and T2/T1 maps) and CT measures (epicardial fat volume and coronary calcium score). RESULTS/ANTICIPATED RESULTS: We anticipate to learn about epicardial fat biology and the role of inflammation in cardiometabolic disease. We will validate proton density fat fraction, T2* and T2 map against histology of epicardial fat for lipid content, established markers of brown and white fat and inflammation, respectively, to help us translate imaging technique to clinical practice. In respect to our second aim we anticipate that MR identifies patients at lower cardiovascular risk quartile than CT. DISCUSSION/SIGNIFICANCE OF IMPACT: Interest in epicardial fat as a visceral fat of the heart and coronary arteries is rapidly growing as the scientific based evidence indicates that the anatomic specificity is an important contributor to the cardiovascular diseases. The transformation of epicardial fat from a cardioprotective phenotype to a pro-inflammatory, atherosclerosis-promoting state triggers inflammation that is coincident with the expansion of epicardial fat volume detected by anatomic imaging. This study will impact the management of patients at risk for cardiovascular disease because it will demonstrate that quantification of epicardial fat status by MR identifies fat tissue changes validated by histology at lower cardiovascular disease risk quartile than CT.

2371

Perception- and behavior-related attention systems distinguished by phase amplitude coupling and high-gamma power

Ravi Varkki Chacko, Kenny Kim, Kate Jung, Gordon Shulman, Maurizio Corbetta and Eric Leuthardt

OBJECTIVES/SPECIFIC AIMS: Attention is a cognitive function that binds perception and behavior. Recent evidence suggests that attention involves phase-amplitude coupling (PAC) of neural signals. PAC occurs when the amplitude of one frequency (frequency for amplitude) is maximal at particular phases of another frequency (frequency for phase). However, some studies suggest PAC improves attention, while others maintain that PAC inhibits attention. The present study seeks to determine whether PAC promotes or inhibits neural signals that underlie attention. METHODS/STUDY POPULATION: Six adult epilepsy patients with implanted electrodes participated in a cued attention task. Subjects participated in a cued attention task where they oriented attention to one side of the screen at a time and discriminated between stimuli as fast as possible with mouse clicks. Perception-related electrodes discriminated the location and/or shape of the target. These were determined with a cluster-based permutation test. Behavior-related electrodes predicted reaction time (RT) with neural activity prior to target appearance. These were determined with correlations between PAC and RT. PAC was calculated using the modulation index (MI). RESULTS/ANTICIPATED RESULTS: We found 47 perception-related electrodes that discriminated location and/or shape of target ($p < 0.05$, FDR corrected). We found 27 behavior-related electrodes where PAC prior to the target predicted RT ($p < 0.05$ FDR corrected). There was little overlap between the perception-related and behavior-related electrodes (3%). PAC also did not discriminate left-sided and right-sided cues. In addition, behavior-related electrodes had less local neural activity and higher PAC during the period of cued attention than perception-related electrodes. DISCUSSION/SIGNIFICANCE OF IMPACT: PAC minimally facilitates perceptual aspect of visual attention. However, PAC facilitate response speed. We suggest that PAC might improve response speed by "quieting" task irrelevant neural activity. For the same reason, PAC is absent in electrodes that are actively processing meaningful streams of visual data. These findings highlight separable aspects of the human attention system and how PAC contributes to both. Future directions include determining differences in PAC for attentional disorders like ADHD and neurological neglect.

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Metabolite and biomarker predictors of WTC-lung injury: An integrated multiplatform pilot analysis

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OBJECTIVES/SPECIFIC AIMS: In this pilot case-control study, the metabolome was quantified in subjects with previously measured serum and clinical biomarkers. The serum metabolome was then integrated with existing serum and clinical biomarkers of WTC-exposed firefighters to identify pathways significant to loss of lung function following acute PM-exposure. This robust subset of metabolite and serum biomarkers may be clinically relevant to predicting progression to lung disease in a larger cohort. METHODS/STUDY POPULATION: Serum drawn within 6 months of 9/11 was analyzed in this pilot. Clinical measures were obtained from electronic medical records. Never-smoking, male, WTC-exposed firefighters with normal pre-9/11 lung function were segregated based on FEV1 percent predicted (FEV1 %Pred) at symptomatic presentation. Cases of WTC-LI (FEV1 %Pred < LLN, n = 15) and controls (n = 15) were identified from previous cohorts. Ultrahigh performance liquid chromatography tandem mass spectroscopy quantified the metabolomic fingerprints of a group with previously assessed (by multiplex panels; ELISA and Luminex) serum chemokines and cytokines. High-dimensional data analysis and dimension reduction techniques integrated metabolites, cytokines, chemokines, and clinical data to identify pathways of

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WTC-LI on curated data. Random Forest (RF) out-of-bag estimated success rates were used to measure classification utility of the refined biomarker profile. Principal components analysis (PCA) was used to visualize class separation produced by the refined profile. RESULTS/ANTICIPATED RESULTS: Of the 765 metabolites detected, 580 metabolites were quantified in more than 80% of subjects/group with relative standard deviation $\geq$15%. Relevant chemokines, cytokines, and clinical biomarkers were included based on previously established clinical importance. Initial PCA explained 34.7% of the variance in the first 3 components. RF was used to identify the top 5% of biomarkers important to class separation. RF of the refined biomarker profile correctly classified cases and controls with a 96.7% estimated success rate. A PCA of the refined metabolic profile now explained 46.2% of the variance in components 1–3, demonstrating improved class separation. Differentiators between cases of WTC-LI and controls included elevated sphingolipids in cases of WTC-LI. The metabolic-inflammatory serum biomarkers MDC, Apo AI, GM-CSF, and heart rate play an important role in class separation. Phospholipids and lysolipids also appeared to differentiate cases of WTC-LI from controls. Specifically, several glycero-phosphatidylcholines (GPC) were elevated in cases of WTC-LI. DISCUSSION/SIGNIFICANCE OF IMPACT: High-dimensional data analysis on the metabolic fingerprints, serum, and clinical biomarker data of a subset of WTC-exposed 9/11 rescue workers has identified pathways associated with the loss of lung function. Sphingolipids, known to function as inflammatory signaling mediators, are thought to play important roles in lung function under both physiological and pathological conditions. Changes in sphingolipid metabolism have been linked to several pulmonary disorders, including asthma, COPD, and acute lung injury. Interestingly, a relation between sphingolipid metabolism and the metabolic-inflammatory pathway is suggested by similarities observed in PCA. Findings of elevated GPCs are similar to COPD literature. Higher levels of GPCs could correspond to elevated levels of lysophosphatidic acid (LPA), a ligand of RAGE. RAGE is a known proinflammatory mediator; LPA species have well-described roles as lipid signaling molecules, function as synthetic intermediates in other metabolic pathways, and were found to be predictive of WTC-LI. Since metabolites are more proximal markers of disease processes, metabolites could capture the complexity of past exposures and, therefore, may better inform treatment. These pathways warrant further investigation into their mechanisms and therapeutic importance.

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Electrical stimulation to the subcallosal cingulate and amygdala drive shifts in affective bias across patient populations

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OBJECTIVES/SPECIFIC AIMS: Deep brain stimulation is currently being evaluated as an experimental therapy for various psychiatric disorders, as well as being investigated as a method for mapping emotional brain functions. This growing area of research requires sensitive measures to quantify effects of stimulation on emotional processing. The current study examined the effects of acute stimulation to 2 limbic regions—the subcallosal cingulate (SCC) and the amygdala—on bias in the perception and evaluation of emotional facial expressions. We hypothesized that transient electrical stimulation to the limbic system would produce acute reductions in negative bias, consistent with its antidepressant effects in patients with severe depression. METHODS/STUDY POPULATION: The current study uses a novel affective bias task, developed to rapidly and covertly quantify emotional state. Over 4–6 minutes, patients rate the intensity and valence of static images of emotional facial expressions. We examined effects of electrical brain stimulation in 2 groups: patients with treatment-refractory depression undergoing SCC DBS therapy, and epilepsy patients undergoing amygdala stimulation via stereo-EEG electrodes during inpatient intracranial monitoring. DBS patients completed the task under stimulation and sham conditions during monthly visits over the first 6 months of therapy, as well as daily during a 1 week, blinded period of DBS discontinuation at the 6-month time point. Epilepsy patients completed the task under stimulation and sham conditions at a single visit. Mixed linear models and paired-samples *t*-test were used to investigate effects of stimulation as well as depression scale scores on affective bias ratings. RESULTS/ANTICIPATED RESULTS: Four SCC DBS patients showed significant effects of stimulation ($p < 0.0001$) and depressive state ($p < 0.0001$) on affective bias scores across 6 months of chronic DBS therapy, where emotional faces were perceived as less sad with stimulation ON, as well as during visits in which patients were nondepressed (typically later in the treatment course). Furthermore, 2 DBS patients showed rapid negative shifts in bias following acute blinded discontinuation of chronic stimulation, an effect which persisted over the 1-week period of discontinuation ($t_{29} = -2.58$, $p = 0.015$), in the absence of any self-reported change in mood. Likewise, 6 epilepsy patients showed significant positive shifts in affective bias with acute amygdala stimulation ($t_5 = -4.75$, $p = 0.005$). Current analyses are investigating electrophysiological, autonomic and facial motor correlates to affective bias in these patients. DISCUSSION/SIGNIFICANCE OF IMPACT: Affective bias has revealed rapid, significant changes with stimulation at 2 limbic targets—one a white matter hub and one a nuclear subcortical structure—suggesting the task's utility as an emotional outcome measure in brain stimulation studies. These stimulation-sensitive measures may provide a new metric to track treatment response to deep brain stimulation therapy for affective disorders. Future studies will determine whether affective bias can predict neuropsychiatric complications in patients undergoing stimulation mapping of brain circuitry ahead of resection surgery for epilepsy.

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Detecting cardiometabolic disease through breath analysis: A metabolomic approach

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OBJECTIVES/SPECIFIC AIMS: The purpose of this study is to use the baboon as a novel animal model for breath research and to identify and characterize baboon breath metabolites that reflect cardiometabolic function to inform us in the development of a noninvasive, cost-effective, and repeatable point-of-care diagnostic breath test. METHODS/STUDY POPULATION: Blood and urine was collected from control and IUGR at the approximate age of 3.5 years. Both groups were then placed on a high fat, high sugar, high salt diet for 7 weeks, after which blood, urine, and breath were collected. The breath samples were then subjected to comprehensive, 2-dimensional gas chromatography coupled with time-of-flight mass spectrometry. Using ChromaTOF software, breath VOCs were identified with at least an 80% spectral match against the National Institute of Standards and Technology (NIST) chemical reference library. The raw data were then statistically analyzed using MetaboAnalyst. We then interrogated multiple online databases to characterize and identify the role of VOCs that were present in both control and IUGR groups. RESULTS/ANTICIPATED RESULTS: Preliminary analyses of the breath VOCs indicate differences in expression between sexes and in control Versus IUGR groups. These results indicate unique "breath signatures." Further analysis of the breath VOCs reveals the presence of metabolites that are involved in β-oxidation and oxidative stress pathways. DISCUSSION/SIGNIFICANCE OF IMPACT: This breath study, a first of its kind, will develop the baboon as a superior animal model for breath biomarker research. Our observed unique "breath signatures" indicate changes in lipid metabolism and oxidative stress pathways, which we hypothesize are the early metabolic changes at the cellular level that are not yet reflected in clinical lab measures. Future directions include analyzing breath VOCs that did not meet 80% spectral match, validation using SPME technology and commercial standards, and initiating a human pilot study in clinically obese, at-risk children in collaboration with physicians at the Children's Hospital of San Antonio to develop a noninvasive, cost-effective, rapid, and repeatable point-of-care diagnostic breath test.

2399

Protective immunity to live vaccines among children with solid tumors

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OBJECTIVES/SPECIFIC AIMS: Determine whether children with solid tumors maintain intact protective immunity to live vaccines during cancer therapy and after completing cancer therapy (postTx). METHODS/STUDY POPULATION: We will perform a prospective cohort study of children with solid tumors (Hodgkin lymphoma, brain, Wilms, and germ cell tumors) followed at the Puerto Rico's University Pediatric Hospital. Protective immunity will be measured with antibody titers against live vaccines (Measles, Mumps, Rubella, and Varicella) at diagnosis, during cancer therapy, upon completion and

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3 months postTx. RESULTS/ANTICIPATED RESULTS: We hypothesize that those patients with protective immunity to live vaccines prior to cancer therapy will lose it at the end of therapy. DISCUSSION/SIGNIFICANCE OF IMPACT: Loss of protective immunity to live vaccines has been reported in patients with hematologic malignancies after cancer therapy. This lack of protective immunity, which puts patients at higher risk of acquiring vaccine preventable diseases, has been limited studied in patients with solid tumors. The Center for Diseases Control has been established that it is safe to immunize cancer survivors with live vaccines 3 months post Tx. However, no clear guidelines for revaccination have been provided for this population. Understanding the protective immunity variation against live vaccines in children with solid tumors will allow us to identify the need for revaccination with live vaccines in this vulnerable population.

2411

A pilot study: Using computational fluid dynamics to model physiologic airflow through an ovine tissue engineered tracheal graft

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OBJECTIVES/SPECIFIC AIMS: Tissue engineered tracheal grafts (TETG) could provide a life-saving cure for children with long segment airway defects. Computational fluid dynamics (CFD) is a novel and promising technique used to evaluate TETG performance. This pilot study examines the correlation of objective CFD simulations with subjective respiratory symptoms in a TETG large animal model. METHODS/STUDY POPULATION: Three-dimensional geometries of 1 TETG implanted sheep trachea were reconstructed from serial fluoroscopic images, allowing analysis with CFD simulations. Peak flow velocity (PFV) and peak wall shear stress (PWSS) across the graft as well as changes secondary to stenting were determined. CFD metrics were compared with respiratory symptoms seen on exam. RESULTS/ANTICIPATED RESULTS: Two weeks after implantation, the animal developed respiratory distress, which correlated with PFV and PWSS elevations. Although the intraluminal graft appearance changed minimally after dilation, PFV and PWSS decreased across the graft (4.5–0.8 m/s and 0.9–0.1 Pa, respectively). Long-term TETG stenting with dilation returned PFV and PWSS to baseline (0.8–0.3 m/s and 0.1–0.01 Pa, respectively), which correlated with immediate symptom resolution. DISCUSSION/SIGNIFICANCE OF IMPACT: CFD is a noninvasive modality, which allows the evaluation of airflow metrics of symptomatic TETG recipients. This diagnostic tool will permit planned interventions and graft design optimization.

2442

Alcohol reduces the ability to regulate emotion when exposed to evocative partner stimuli in individuals with a history of intimate partner violence

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OBJECTIVES/SPECIFIC AIMS: The objective of this research was to investigate the effect of alcohol and evocative stimuli on heart rate variability (HRV) in partners with a history of intimate partner violence in a placebo-controlled alcohol administration study with an emotion-regulation task. METHODS/STUDY POPULATION: In total, 17 partners (9 females, 8 males) with a history of partner violence participated in a placebo-controlled alcohol administration study with an emotion-regulation task during which HRV measures were collected. In the alcohol condition, participants were administered a mixture of 100 proof vodka and cranberry juice calculated to raise their blood alcohol concentration (BAC) to 0.08%. In the placebo condition, participants consumed a volume of juice equivalent to that consumed in the alcohol condition, but without alcohol. Alcohol and placebo conditions were counter-balanced across participants as were the presentation the blocks of evocative and neutral partner stimuli. RESULTS/ANTICIPATED RESULTS: Controlling for baseline HRV, there was a significant main effect of stimuli (evocative vs. neutral partner stimuli) on HRV in intoxicated partners, $F_{1,16} = 16.28$, $p = 0.004$. There was also a significant main effect of regulation on HRV under conditions acute alcohol intoxication, $F_{1,16} = 23.55$, $p = 0.001$. These effects tell us that intoxicated partners experienced reduced HRV when exposed to evocative stimuli from their partners. These effects also tell us that under acute alcohol intoxication, partners were less able to regulate their emotion when exposed to evocative stimuli than when they consumed a placebo beverage. DISCUSSION/SIGNIFICANCE OF IMPACT: These results suggest that increases in intimate partner violence under acute alcohol intoxication may be the result of reduce HRV. This reduction in HRV would contribute to partners' inability to response with adaptively in conflict when intoxicated. They also suggest that HRV may be an important target for intervention with partner with a history of intimate partner violence. One method may be Heart Rate Variability Biofeedback which has been shown to increase parasympathetic nervous system functioning, autonomic stability, and emotion regulation.

2477

Biofilms in wounds: Detection, individualizing treatment and monitoring response to therapy

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OBJECTIVES/SPECIFIC AIMS: The specific objectives of this project are (1) identify, test, and validate the parameters for a simplified NLOM imaging probe that will provide specific research and point-of-care information on biofilm presence, therapeutic need and response of individual wounds to treatment. (2) Identify specific proteomic and metabolomic biomarkers of (i) wound susceptibility to infection, (ii) wound response to the most commonly used antibacterial measures in wounds, and (iii) establish criteria for more effective interventions. METHODS/STUDY POPULATION: First, optimal use parameters for NLOM including illumination, field of view, focal length, linear Versus concentric image acquisition, detection and filter wavelengths were identified. Parameters for evaluation included ease and speed of imaging, ability to map diagnostic criteria. Next, using the optimised NLOM imaging modality in bacterial biofilm isolates and subsequently a rabbit ear model of biofilm wound infection, proteomic and metabolomic biomarkers of susceptibility to infection were identified. The effects of 2 standard debridement and anti-infective treatments, polyvidone-iodine solution or cetrimide 15%+ chlorhexidine gluconate 1.5% were mapped in situ for up to 10 days using the NLOM probe. RESULTS/ANTICIPATED RESULTS: Using the novel custom NLOM probe, high resolution mapping of wound biofilm infection, as well as the underlying tissue was performed throughout the onset, development, treatment, and resolution of wound biofilm infection. Specific microbiological, microstructural, oxygenation, and pH parameters were mapped at defined surface and subsurface locations and time-points. Findings included the determination that some standard antimicrobial formulations provide a supportive environment for wound infection, and that micro-channels within the biofilm and their interface with the tissues serve as an important predictor and indicator of wound infection establishment, progression, and response. DISCUSSION/SIGNIFICANCE OF IMPACT: The novel multimodality in vivo NLOM imaging approach establishes an important tool for earlier and more specific diagnosis of wound infection risk, virulence, and invasiveness along with markers of successful treatment, and a simple clinical imaging tool for improving wound infection prevention and treatment.

2485

ETV6 represses Pax5 in early B-cell development

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OBJECTIVES/SPECIFIC AIMS: The goal of this project is to determine the role of ETV6 in early B-cell development and define how germline ETV6 mutations result in predisposition to leukemia. METHODS/STUDY POPULATION: Gene expression commons were queried for expression levels of Etv6 and Pax5 at different stages of hematopoiesis. Mouse bone marrow was isolated and fractioned into cells committed to the B cell lineage via B220+ and CD43+ staining by flow cytometry and then separated into the following fractions: Fraction A (CD24low, CD19−), Fraction B (CD19+, CD24+, BP1−), and Fraction C (CD19+ CD24+ BP1+). Wild-type or germline mutant P214L ETV6 were cloned in an MiG vector and expressed in Ba/F3 cells. ChIP-PCR was performed by cross-linking proteins to DNA with 1% formaldehyde for 10 minute at room temperature, followed by cell lysis with RIPA buffer. Lysates were sonicated to shear DNA to a length of 200–1000 base pairs, then Protein A agarose beads were used to clean and immunoprecipitate chromatin. RESULTS/ANTICIPATED RESULTS: We observed that Etv6 is highly expressed in hematopoietic stem and lymphoid progenitor cells through the pre-pro-B stage (FrA), but its expression is significantly reduced in fraction B and

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thereafter ($p < 0.0001$). Etv6 expression decreases as B cells develop and is negatively correlated with Pax5 expression ($r^2 = 0.9993$; $p = 0.0167$). We next confirmed the expression patterns of ETV6 and PAX5 during B cell development in human samples. We found that ETV6 expression was higher in the early B cell fraction (CD10+, CD34+, CD19−, and CD20−) compared to the pre-B cell fraction (CD10+, CD34−, CD19+, CD20−). Conversely, we observed that PAX5 expression was higher in the preB cell fraction compared with the early B cell fraction. In Ba/F3 cells expressing ETV6 constructs, ETV6, but not ETV6 P214L overexpression significantly decreased Pax5 expression ($p \leq 0.05$). ETV6 is associated with the proximal GGAA site 72 base pairs upstream of the Pax5 TSS, but not GGAA sites further from the TSS. In addition, the transcriptional repressors SIN3A and HDAC3 were detected on the same regions of the Pax5 locus. We detected association of ETV6, SIN3A, and HDAC3 with the proximal GGAA site upon expression of WT ETV6, but not ETV6 P214L. DISCUSSION/SIGNIFICANCE OF IMPACT: Our results provide a mechanism of interaction for ETV6 and PAX5, 2 genes often disrupted in B-cell leukemia. These findings are significant because PAX5 misregulation results in a B cell development halt, lineage infidelity, and leukemogenesis. In continuing our studies, we have generated a transgenic mouse endogenously expressing the ETV6 P214L mutation by CRISPR/Cas9 editing, and these mice appear to have a thrombocytopenic phenotype similar to that observed in patients carrying the ETV6 P214L mutation. These animals will be the focus of our continued investigation of the mechanism by which ETV6 germline mutation results in a predisposition to leukemia. Our ultimate goal is a comprehensive understanding of how this process may be targeted more efficiently in patients with both heritable and sporadic forms of leukemia involving ETV6.

2486

Sleep, biological stress, and health in a community sample of toddlers living in socioeconomically disadvantaged homes

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OBJECTIVES/SPECIFIC AIMS: The purposes of this study are to examine the relationships among sleep characteristics (duration, efficiency), stress biomarkers, and child behavior problems among toddlers living in socioeconomically disadvantaged homes and how these characteristics change over time from age of 12 months to 24 months. Aim 1: examine changes in subjective and objective sleep characteristics from 12 to 24 months of age. Aim 2: examine changes in stress biomarkers from 12 to 24 months of age. Aim 3: examine the cross sectional and longitudinal relationships between sleep characteristics and stress response. Aim 4: examine the cross sectional and longitudinal relationships between sleep characteristics and toddlers' child behavior problems. METHODS/STUDY POPULATION: In this cross-sectional study we are recruiting parents with healthy toddlers from early head start programs and a community clinic to prospectively examine the relationships among sleep characteristics, stress biomarkers, and children's health. Data on sleep characteristics will include subjective and objective measures of sleep duration and efficiency and parental interactive bedtime behaviors to assist their toddlers' sleep initiation. Multi-systemic biomarkers of stress including cortisol, CRP, IL-6, and BMI, will be measured individually. The associations between sleep characteristics and the biomarkers, considered as a latent variable of the stress response, will be explored. Health measures will include secretory IgA and parent-reported behavioral problems. Generalized linear models will be used in the data analysis. RESULTS/ANTICIPATED RESULTS: To date we have obtained objective (9 days/nights of actigraphy) measures of 33 toddlers' sleep and subjective measures of parenting interactive behaviors. Using the Parental Interactive Bedtime Behavior (PIBB) Survey and subscales [active physical comforting, encourage autonomy, settle by movement, passive physical comforting (PPC), social comforting], we are currently reporting on the associations between PIBB and toddler's sleep characteristics. The sample included 33 toddlers (mean age = 1.33 years, SD = 0.54). The toddlers' sleep duration averaged 8.22 hours (SD = 0.86). There were statistically significant moderate associations between sleep duration and parents' PPC ($r = -0.41$, $p = 0.02$). Intra-individual variability in the amount of wake after sleep onset was also significantly associated with total PIBB and PPC ($r = 0.37$, $p = 0.05$; $r = 0.52$, $p = 0.002$, respectively). Intra-individual variability in the amount of sleep fragmentation within toddlers was significantly associated with total PIBB ($r = 0.36$, $p = 0.05$). DISCUSSION/SIGNIFICANCE OF IMPACT: Although active physical comforting (eg, rocking to sleep, patting or rubbing child's back) is most commonly associated with sleep patterns in infancy and toddlerhood among samples of higher socio-economic status, findings from this study suggest a stronger association between PPC (eg, presence of the parent in the room to fall asleep) and less sleep duration and more individual variability in night wakings. The biomarker data are currently being analyzed and results will be presented within the year. Taken together, these preliminary results and pending results will inform future intervention development that may address the role of parenting behavior in promoting health sleep early in life.

2493

GABA-A receptor binding is abnormal in sensory-motor integration brain regions in Cervical Dystonia

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OBJECTIVES/SPECIFIC AIMS: Determine whether GABA-A receptor binding is abnormal and linked to dystonia symptoms in cervical dystonia (CD). METHODS/STUDY POPULATION: There is increasing evidence that a key pathophysiological mechanism in adult-onset focal dystonia is a reduction in inhibitory control over the sensorimotor network. Results from a recent 11C-flumazenil PET imaging study suggest that abnormal inhibitory signaling in genetic and sporadic forms of dystonia may be due to reduced GABA-A binding. It remains unknown whether CD, the most common form of adult-onset focal dystonia, is associated with abnormal GABA-A binding. The goal of this research is to determine if GABA-A receptor binding is abnormal and linked to dystonia symptoms in CD. RESULTS/ANTICIPATED RESULTS: We investigated whole brain GABA-A binding in 15 CD patients (11F; 64 ± 8 y) and 15 healthy controls (10F; 64 ± 9 y) using 60-minute dynamic 11C-flumazenil PET scans. GABA-A receptor binding potential (BP) was estimated using a simplified reference tissue model. A 2-sample *t*-test was used to identify voxel-wise GABA-A BP differences between groups, and a regression analysis used to test for correlations between GABA-A BP and disease severity as measured with the Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS). A conventional region of interest analysis was also conducted to quantify BP changes within the sensorimotor network using the automated anatomical labeling atlas. DISCUSSION/SIGNIFICANCE OF IMPACT: CD patients have reduced GABA-A receptor binding compared with healthy controls, with the greatest reduction seen within the sensorimotor region of the thalamus. Furthermore, reductions in GABA-A binding in brain regions associated with coupling sensory and motor information predict motor severity. These findings support that reduced GABAergic signaling within sensorimotor integration regions is a key mechanism underlying dystonic symptoms in CD and could help inform the development of better, more targeted treatment options.

2518

Development of a clinically relevant rabbit surgical model for investigation of the host response to polypropylene mesh for pelvic organ prolapse

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OBJECTIVES/SPECIFIC AIMS: Mesh properties, such as stiffness, porosity, and weight have been shown to correlate with the degree of mesh integration with vaginal tissue. Previous research in rhesus macaques implanted with polypropylene mesh differing in stiffness, porosity, and weight showed differences in vaginal deterioration following mesh implantation. These differences were correlated with a foreign body response, consisting primarily of activated, proinflammatory M1 macrophages. Previous studies have determined that the early macrophage polarization profile following biomaterial implantation is a strong indicator of overall tissue integration downstream. However, these early responses have not been previously observed in the appropriate surgical models. Prior work from our laboratory in developing a cytokine delivery system has shown that shifting the macrophage response at the host-implant interface from a pro-inflammatory M1 phenotype to an anti-inflammatory M2 phenotype in the first 14 days postimplantation resulted in enhanced integration of the mesh with the surrounding tissues. The present study develops an in vivo model clinically relevant surgical model to investigate the modulation of the host response to mesh. Utilizing a moderately-sized animal, we can feasibly implant mesh using the "gold standard" abdominal sacrocolpopexy procedure and evaluate the changes in the host immunologic response at early (14 d) and tissue remodeling outcomes at late stages (90 and 180 d) of implantation. METHODS/STUDY POPULATION: Commercially available heavyweight and lightweight mesh was used to investigate the modulation of the immune response. A custom MTI SILAR Automated Dip Coating machine is used to uniformly coat the mesh in a reproducible manner. An adapted radio frequency glow discharge method is used to create a stable negative charge on the surface of the mesh, followed by the sequential deposition of polycationic and polyanionic polymers to provide a stable, conformal, nanoscale coating. Chitosan served as the polycation, chosen because of its known antimicrobial and biocompatibility properties. Dermatan sulfate served as the polyanion, chosen for its important role in regulating extracellular matrix

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components and enhancing the activity of cytokines. Interleukin-4 (IL-4) is incorporated into the coating to be released in a controlled manner upon implantation. In vitro controlled release profiles were assessed to demonstrate efficient and local release of IL-4. Utilizing a New Zealand white rabbit surgical model, we implant mesh using the "gold standard" abdominal sacrocolpopexy procedure and evaluate the changes in the host immunologic response at early (14 d) and tissue remodeling outcomes at late stages (90 and 180 d) of implantation. The mesh-tissue complex was removed from each rabbit and processed for histological staining as well as immunolabeling of immune cells, such as macrophages. Determination of matrix metalloproteinases and fibrotic capsule formation also helps characterize the overall inflammatory response associated with each implant. RESULTS/ANTICIPATED RESULTS: We have developed a clinically relevant rabbit surgical model to implant different conditions of surgical mesh into 2 different sites, including the vagina and the abdomen. The results of this study show that implants into vaginal tissues elicited an increased host inflammatory response at 14 days as compared with those in the abdominal wall. However, at chronic time points the inflammatory response in the vagina was reduced as compared to that in the abdominal cavity. The present study also demonstrates the scale-up of a previous methodology for nano-scale coating. We present a nanometer thickness, tunable, and uniform coating capable of releasing bioactive IL-4. In vitro assays confirm the bioactivity and the controlled local release allowing for shifts in the immune response to promote implant integration. Improved remodeling has been observed to correlate with a shift in the early host response from an M1 to an M2 phenotype, however, there is limited information on the exact mechanism. Our strategy to achieve enhanced tissue remodeling demonstrate outcomes such as minimal changes to the structural properties of the mesh and a controlled release profile to sufficiently polarize macrophages around the mesh to a pro-remodeling state. DISCUSSION/SIGNIFICANCE OF IMPACT: Pelvic organ prolapse is a condition where the pelvic floor muscles weaken over time resulting in the downward shift of the pelvic organs into the vaginal canal. Moreover, factors such as obesity, age, and vaginal birth increase the susceptibility of being diagnosed with pelvic organ prolapse. Direct costs of reconstructive procedures exceed $1 billion each year in the United States. Synthetic mesh has been used to repair abdominal hernias for over half a century. Biomedical companies, through 510k and the 1976 Medical Device Amendments Act, were able to resell their hernia repair mesh as a treatment for pelvic organ prolapse. However, women who have had vaginal mesh implants have reported an increasing number of complications including chronic pain and mesh erosion/exposure at rates as high as 10%–20%. In fact, in 2008 and 2011, the US Food and Drug Administration issued warnings to doctors and patients about the mesh. In January 2016, the FDA officially had to reclassify surgical mesh for transvaginal repair of pelvic organ prolapse from a class II, moderate risk device, to a class III, high-risk device. Presently, data for the use of synthetic mesh has largely derived from abdominal hernia repair, instead of vaginal repair of prolapse. In the rodent model, the vagina is too small to implant mesh in an analogous manner to human implantation. Instead, implantations are done in the abdomen, a different tissue composition and host response profile than the vagina. Primate models of pelvic organ prolapse have been utilized, but are associated with high costs and investigation of acute immune responses are not considered ethical due to the short time of survival. Thus, our presented work will not only show the development of an improved material for implantation, but also the development of an in vivo model clinically relevant to understanding the early host response to mesh.

2519

A quantitative disintegration method to evaluate polymeric films

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OBJECTIVES/SPECIFIC AIMS: To establish an in vitro quantitative method for the evaluation of polymeric film disintegration that can be applied to predict in vivo behavior. METHODS/STUDY POPULATION: Two clinically advanced vaginal microbicide film products containing tenofovir and dapivirine were used as model films throughout this work. Films were made using the solvent cast manufacturing method in which polymers, excipients, plasticizer, and APIs were either dissolved or dispersed in water, mixed, and cast on a heated substrate. The novel, quantitative method was developed using a TA.XT Plus Texture Analyzer® (Texture Technologies) in combination with a TA-108S5 fixture and the TA-8A: 1/8″ diameter rounded end ball probe. Exponent® was used as the data analysis software. In this method, the film was placed and secured in the fixture, the probe applied a constant force to the film product, and a biologically relevant amount of fluid was applied to the film. The probe was able to penetrate the film upon disintegration resulting in an applied force of zero at that point. A curve of force Versus time was plotted, and disintegration time was defined as the time between fluid addition until the probe force reached zero. Test parameters were optimized in order to reduce error. Visual observation of film disintegration was conducted in the in vivo macaque model using films that included a water-soluble blue dye for film visualization. Colpophotography was also used to confirm film disintegration. In vitro results were compared with in vivo findings. RESULTS/ANTICIPATED RESULTS: The Texture Analyzer disintegration method developed provided quantitative disintegration times and did not rely on user defined endpoints which is common in many visual disintegration tests. The disintegration method was able to distinguish differences between the 2 clinical film products and produced reproducible disintegration times for the tenofovir and dapivirine films. The tenofovir film had a shorter disintegration time (41.28 ± 2.85 s) compared with that of the dapivirine film ($88.3\ 6 \pm 9.82$ s). This method was also able to distinguish changes made to these 2 clinical film products in terms of volume and formulation alterations. In vitro and in vivo disintegration times differed by orders of magnitude, with in vitro time being measured in seconds and in vivo time being measured in days, for a variety of factors, mainly the application of constant force to the film product. Regardless of these differences, the rank order of film disintegration remained constant for in vitro and in vivo disintegration and an In Vitro In Vivo Correlation (IVIVC) trend could be seen. DISCUSSION/SIGNIFICANCE OF IMPACT: Standardization of preclinical in vitro assessments which minimize user bias are crucial to the field of pharmaceutical film development. As this field continues to develop and more products advance for pharmaceutical application, this method has the potential to become a standard assessment of film functionality. This study represents a first step in the process of developing an IVIVC. More films will need to be tested using both in vitro and visual methods in order to establish and accurate factor to predict in vivo behavior.

2529

Clinical determinants of clopidogrel responsiveness in a heterogeneous cohort of Caribbean Hispanics

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OBJECTIVES/SPECIFIC AIMS: To determine the association between clinical characteristics and platelet reactivity in Hispanic patients on clopidogrel therapy. METHODS/STUDY POPULATION: A cross-sectional pilot study was performed in 58 Puerto Rican patients diagnosed with any type of vascular disease and actively receiving a maintenance dose of clopidogrel for at least 7 days. The study population was divided into 2 groups: Group I with non-high on-treatment platelet reactivity (TPR); Group II with high TPR. To determine the platelet function, P2Y12 reaction units (PRU) were obtained by VerifyNow® P2Y12 assay (Accumetrics, USA). RESULTS/ANTICIPATED RESULTS: We studied a heterogeneous cohort of patients with coronary artery disease (57%), peripheral artery disease (30%), carotid artery stenosis (7%), cerebral artery aneurysm (3%), and stroke (3%) on clopidogrel therapy for secondary prevention of thromboembolic events. The mean TPR was 205 ± 49 PRU (range: 61–304), with a prevalence of 28% patients with high TPR (PRU $\geq$ 230). No significant clinical differences were found between the non-high TPR and high-TPR groups ($p > 0.05$). However, multivariable logistic regression analysis showed that both diabetes mellitus (OR = 7.5; CI: 1.01–51.9) and proton-pump inhibitors (OR = 13.6; CI: 1.3–142.0) were independently correlated with high TPR ($p < 0.05$) after adjusting for other clinical variables. DISCUSSION/SIGNIFICANCE OF IMPACT: These results provide new insight into the importance of clinical characteristics on platelet reactivity in this Caribbean population. Further studies are warranted to determine whether important clopidogrel pharmacogenes are related with platelet function in Hispanics, as well as the role of TPR in guiding antiplatelet therapy and predicting future adverse cardiovascular events in this population.

OUTCOMES RESEARCH/HEALTH SERVICES RESEARCH/COMPARATIVE EFFECTIVENESS

2025

Institutional and community involvement establishing ARresearch.org and innovative recruitment results in diverse registrants

Jean McSweeney, David Robinson, Anthony McGuire, Pamela Christie, Sandra Hatley, Martha Rojo and Laura James

OBJECTIVES/SPECIFIC AIMS: To establish a state-wide research registry of diverse participants. METHODS/STUDY POPULATION: We garnered broad institutional and community support by involving TRI's Community Engagement team, its Community Advisory Board (CAB), and 3 UAMS patient CABs in

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selecting Web site content, images, and colors. Using this feedback, the TRI Recruitment Unit (RU), in conjunction with UAMS Communications and the Center for Health Literacy, developed the materials and crafted comprehensive communication and recruitment strategies. The UAMS Center for Pacific Islander Health, Hispanic faculty, and CAB members translated materials. UAMS IT programmed the user-friendly site to allow registration from smartphones and i-Pads and linked to UAMS patient electronic health messages. RESULTS/ANTICIPATED RESULTS: The RU committee implemented successful innovative strategies, including recruiting at the Arkansas State Fair and ballgames, attended by people of all races, ages, and socio-economic levels. Using i-Pads at the sites, recruitment took <5 minutes/registrant. Within 8 months, >2400 participants from across Arkansas had joined the registry: 14% African-Americans, 8% Pacific Islanders, 5% Hispanic, and 3% Native American. DISCUSSION/SIGNIFICANCE OF IMPACT: Involving CAB multidisciplinary input to design and implement recruitment materials was highly successful. Despite challenges of recruiting under-represented groups, the registry includes 30% minorities. By tracking registrants' demographics with Lime Survey software, the RU will prioritize future recruitment events to maximize diversity of registrants.

2058

Are atrial fibrillation patient-reported outcomes associated with person and environment characteristics?

Kelly Gleason and Cheryl Renee Dennison Himmelfarb

OBJECTIVES/SPECIFIC AIMS: (1) Determine person (sex, age, education level), environment (marital status, living alone, insurance), and health and illness (BMI, type of AF, comorbidities) characteristics that are associated with outcomes (QOL, symptom severity, and emotional and functional status). (2) Determine the association of symptom management strategies (ablation, cardioversion, and rate and rhythm control medications) and outcomes (QOL, symptom severity, and emotional and functional status). (3) Test person (sex, age, and education level) and environment (marital status, living alone, insurance) characteristics as moderators of the effect of symptom management strategies (ablation, cardioversion, and rate and rhythm control medications) on outcomes (QOL, symptom severity, and emotional and functional status). METHODS/STUDY POPULATION: AF patients (≥18 years of age) already enrolled in the PaTH study will be included. To date, 1026 total participants have been enrolled. Based on the enrolled participants, 92% (945) of our study population are Caucasian and 36% (362) are female. The age range of the enrolled participants is: 2% (16) 18−39, 4% (42) 40−49, 11% (108) 50−59, 33% (343) 60−69, 34% (353) 70−79, and 16% (162) 80+. Participants are recruited through in-person, email, phone, patient portal messaging and post mail techniques to ensure a representative sample. The PaTH study integrates electronic health record and insurance claims data with patient-reported outcome measures collected through online surveys. RESULTS/ANTICIPATED RESULTS: We hypothesize that sex, older age, low education level, living alone, absence of partner, absence of insurance coverage, high BMI, and a high number of comorbidities will be associated with lower QOL, high symptom severity, and low emotional and functional status. We further hypothesize that symptom management strategies will be associated with higher QOL, low symptom severity, and high emotional and functional status, and that these associations will be moderated by person and environment characteristics. DISCUSSION/SIGNIFICANCE OF IMPACT: The proposed research is an important first step in determining potential causes of person and environment differences in symptom severity. It will lead to tailored symptom management interventions for individuals most at risk for experiencing high symptom severity.

2061

Prevalence, associated characteristics, and diagnostic and treatment process experiences of women seeking emergency department care after being strangled: A mixed methods study

Michelle Patch and Jacquelyn Campbell

OBJECTIVES/SPECIFIC AIMS: Aim 1—estimate prevalence and associated characteristics of nonfatal, non-self-inflicted strangulation among women ages 18 and older who presented to a US emergency department between 2006 and 2013. Aim 2—explore care-seeking behaviors, the context of the care seeking, treatment expectations and perceived diagnosis in a sample of women ages 18 and older who present to a US emergency department and report being strangled by an intimate partner. Aim 3—merge and synthesize findings from both the quantitative and qualitative strands to provide a more complete understanding of post-strangulation emergency care of women. METHODS/STUDY POPULATION: This mixed-methods study will use a convergent parallel design, with a single phase of concurrent and independent data collection. Analysis of quantitative and qualitative data will be performed separately then compared, with main findings integrated during the interpretation phase and presented in a merged data analysis display. IRB review and approval will be obtained before initiating this study. Aim 1 will include a cross-sectional analysis of 2006–2013 Nationwide Emergency Department Sample (NEDS) data, from the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project (HCUP). NEDS is the US's largest all-payer emergency department (ED) database, providing national estimates of hospital-based ED visits from ~120 to 135 million ED visits/year (weighted). For this study, we will examine data from patients meeting inclusion criteria with an International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM; Medicode, 1996) code of strangulation. For this strand, females aged 18 years or older who presented to a US emergency department between 2006 and 2013 will be included. The outcome variable will be non-fatal, non-self-inflicted strangulation, defined using at least one of the ICD-9-CM codes for strangulation. These codes are: 994.7 ("asphyxiation and strangulation"), E963 ("assault by hanging and strangulation"), E983.8 ("strangulation or suffocation by other specified means undetermined whether accidentally or purposely inflicted"), and E983.9 ("strangulation or suffocation by unspecified means undetermined whether accidentally or purposely inflicted"). Patients with a concurrent ICD-9-CM code for suicide attempt (E953, "Suicide and self-inflicted injury by hanging, strangulation and suffocation") will be excluded, to minimize self-inflicted assault events. Aim 2 will employ a narrative descriptive approach, with semistructured individual interviews to gather more information about women's experiences when engaging the health care system after being strangled. Medical records related to the strangulation event will also be reviewed for diagnostic codes and other nursing and/or medical notes that may relate to diagnoses, treatment and referrals. For this strand, women aged 18 years or older who present for care to an urban, academic ED will be recruited, purposely sampling those reporting strangulation as a reason for their visit. We anticipate interviewing ~20–30 women to achieve saturation of information. RESULTS/ANTICIPATED RESULTS: Data from the NEDS from 2006 to 2013 will be analyzed for prevalence and associated characteristics of women seeking care after being strangled. Individual interviews and medical record reviews of a small sample of adult women will be conducted to explore women's in-depth experiences within the health care system. Results from both the quantitative and qualitative analyses will then be collectively compared and interpreted to better synthesize the evidence from this work. Convergent and divergent findings will be presented in a merged data analysis display (Creswell and Plano Clark, 2011). Qualitative data will be used to fill the knowledge gap remaining from the quantitative analysis, and to explain and contextualize some of the findings. Such integration will help expand the current limited evidence on care of strangled women, and will identify additional research questions that will guide future research in this area. DISCUSSION/SIGNIFICANCE OF IMPACT: To our knowledge, this study will be the first to explore this issue using a nationally representative sample of adult women who sought emergency medical care for strangulation analyzed in conjunction with a detailed qualitative analysis of strangled women's experiences with the health care system. The resulting knowledge will be critical to informing clinical assessment, intervention and prevention efforts for this vulnerable population, as well as public policy and future research regarding this specific violence tactic.

2087

Better Together Lebanon County: A collaboration to improve the health environment and reduce obesity through community-owned initiatives

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OBJECTIVES/SPECIFIC AIMS: Improving public health requires effective community-engaged approaches. The Better Together Lebanon County initiative plans to create opportunities for improved health and quality of life by aligning strategies of local organizations, previously working independently. METHODS/STUDY POPULATION: Better Together began with a 1-day summit, convening stakeholders with the goal of coordinating efforts and maximizing resources in the Lebanon community. Key stakeholders were identified using the socioecological model to assist with planning, goal setting, and developing outcomes for this initiative. Representation included community members, hospital systems, restaurants, school administrators, nonprofit organizations (including YMCA, American Heart Association), grocery stores and policy makers such as the mayor, health departments, and state representatives. RESULTS/ANTICIPATED RESULTS: The Better Together

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summit brought together almost 200 individuals representing 82 local organizations to share ideas and evoke collaboration around decreasing health disparities. Attendees learned about programs within and outside of their communities and volunteered for task forces to propel the community forward. Currently, we have members committed to further this work through Action Teams within the sectors of Physical Activity, Healthy Food Access and Family and Community Engagement. DISCUSSION/SIGNIFICANCE OF IMPACT: Convening individuals from many layers of the community helps to ensure discussions are representative of the overall community voice. It is vital to facilitate effective collaboration that includes networking, identifying assets and areas of improvement, brainstorming solutions and integrating research and best practices to improve the health of a community.

2117

Parenting, anxiety, and adaptive function in children with chromosome 22q11.2 deletion syndrome

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OBJECTIVES/SPECIFIC AIMS: Chromosome 22q11.2 deletion syndrome (22q) has a prevalence almost as common as Down syndrome. 22q is well known for medical complications, including congenital heart disease and immune dysfunction. However, children with 22q also have borderline cognitive abilities, are at high risk for ADHD and anxiety, and have poor independent living skills (adaptive function). Parenting is one modifiable factor that has been found in typically developing populations to promote independent functioning and protect against the development of anxiety disorders. This study investigates the associations between parenting, anxiety, and adaptive functioning in 22q. METHODS/STUDY POPULATION: Parent-child (ages 4–11) dyads participated in an ongoing study involving observed parenting during challenging tasks plus questionnaires of parenting, child anxiety, and child functioning. In total, 52 dyads [22q = 25; typical development (TD) = 27] have enrolled to date. Parents completed questionnaires, including the Parenting Styles and Dimensions Questionnaire (PSDQ), Spence Children's Anxiety Scale, and Adaptive Behavior Assessment System for Children (ABAS-II). PSDQ dimensions of interest included Parental Psychological Control (PPC: the management of child behavior through the manipulation of emotions, expectations, and independence), Authoritative, Authoritarian, and Permissive, and the subscales of these broad dimensions. Scores were compared using *t*-tests and multiple regression models were used to investigate the relationships between 1-parenting and anxiety and 2-parenting and adaptive function. RESULTS/ANTICIPATED RESULTS: Mean age was 7.8+ 2.1 years. Full Scale IQ (TD: 112.3 vs. 22q: 82; $p < 0.001$) and ABAS-II Global Adaptive Composite (TD: 102.7 vs. 22q: 69.2; $p < 0.001$) were significantly higher in the TD group. Parents in the 22q group reported higher levels of PSDQ PPC (22q: 2.3 vs. TD: 2.1; $p = 0.06$), specifically overprotection (22q: 3.7 vs. TD: 3.3; $p = 0.04$), and lower Authoritative parenting (22q: 4.1 vs. TD: 4.4; $p = 0.03$), across the subscales. There were no differences in Authoritarian or Permissive parenting. Children with 22q had higher Spence Total Anxiety scores (22q: 62.5 vs. TD: 47.4; $p < 0.001$). Self-reported PPC and group ($R^2 = 0.3$, $F_{3,48} = 8.1$, $p < 0.001$) predicted child anxiety with a main effect of PPC ($\beta = 16$, $p = 0.02$). Group tended to moderate the association between PPC and anxiety ($\beta = -17.5$, $p < 0.10$), with PPC predicting anxiety for the 22q group ($r = 0.35$, $p < 0.09$), but not the TD group ($r = -0.08$, ns). At this time, a relationship between PPC and child ABAS-II GAC in 22q ($r = -0.14$; $p = 0.5$) is not identified. DISCUSSION/SIGNIFICANCE OF IMPACT: Children with 22q are at high risk for anxiety and poor adaptive outcomes. These results suggest that parents of children with 22q use higher levels of PPC, which is correlated with increased child anxiety. These analyses also provide support for parenting interventions to improve anxiety in children with 22q and possibly mitigate the serious mental health risk in this population.

2135

A novel treatment delivery of acceptance and commitment therapy for chronic pain in an integrated primary care setting

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OBJECTIVES/SPECIFIC AIMS: This study seeks to test the feasibility and effectiveness of a brief acceptance and commitment therapy (ACT) treatment for chronic pain patients in a primary care clinic METHODS/STUDY POPULATION: Primary care patients aged 18 years and older with at least 1 pain condition for 12 weeks or more in duration will be recruited. Patients will be randomized into (a) ACT intervention or (b) control group. Participants in the ACT arm will attend 1 individual visit with an integrated behavioral health provider, followed by 3 weekly ACT classes and a booster class 2 months later. Control group will receive enhanced primary care that includes patient education handouts informed by cognitive behavioral science. Data analysis will include 1-way analysis of covariance (ANCOVA), multiple regression with bootstrapping. RESULTS/ANTICIPATED RESULTS: The overall hypothesis is that brief ACT treatment reduces physical disability, improves functioning, and reduces medication misuse in chronic pain patients when delivered by an integrated behavioral health provider in primary care. In addition, it is anticipated that improvements in patient functioning will be mediated by patient change in pain acceptance and patient engagement in value-consistent behaviors. DISCUSSION/SIGNIFICANCE OF IMPACT: This pilot study will establish preliminary data about the effectiveness of addressing chronic pain in a generalizable integrated primary care setting. Data will help support a larger trial in the future. Findings have potential to transform the way chronic pain is currently managed in primary care settings, with results that could decrease disability and improve functioning among patients suffering from chronic pain.

2141

What is the role of race and ethnicity in the development of thionamide-induced neutropenia?

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OBJECTIVES/SPECIFIC AIMS: Thionamides are anti-thyroid drugs (ATD) that are commonly used to treat autonomous thyrotoxicosis. Although efficacious, these medications carry a risk of neutropenia or agranulocytosis in a small but finite proportion of the patients who receive them. Some risk factors for thionamide-induced neutropenia have been identified, including body mass index (BMI) and dose, but the role of race and ethnicity in the pathogenesis of this potentially life-threatening side effect is not known. We hypothesize that there will be no effect of race or ethnicity on the change in absolute neutrophil count (ANC) following initiation of thionamide therapy among adult patients with thyrotoxicosis. METHODS/STUDY POPULATION: Data from the electronic medical record at UNM HSC were obtained using a standard database query for the years 2000–2016. Inclusion criteria were the prescription of an ATD, an ANC recorded within 30 days of initiating ATD therapy (pre-ATD), and an ANC recorded between 75 and 365 days after starting an ANC (post-ATD). Patients taking other agents known to cause neutropenia and agranulocytosis, such as clozapine, allopurinol, or chemotherapy, were excluded. Patients were assigned to racial and ethnic groups as follows: Hispanic, non-Hispanic Caucasian (NHC), native American, Black, and Asian. The post-ATD ANC was defined as the nadir ANC observed after the ATD was started. "Delta ANC" was defined as [(post-ATD ANC) − (pre-ATD ANC)]. ANOVA analysis with Bonferroni-adjusted post-hoc testing was performed to examine differences in the mean changes of ANC across ethnic groups. RESULTS/ANTICIPATED RESULTS: In total, 123 adult patients met inclusion and exclusion criteria and were included in the analysis. No significant difference was found between any of the racial groups with regard to age, sex, BMI, pre-ATD ANC, or the pre-ATD to post-ATD ANC interval. The native American group showed a significantly greater post-ATD ANC (not shown) and Delta-ANC as compared with the other groups. Delta ANC Hispanic = −1.4 ± 3.3, Caucasian = −0.6 ± 3.3, Black = −0.9 ± 4.1, Asian = −3.8 ± 4.8, native American = 3.6 ± 5.1 (all units per mm^3; $p < 0.001$). DISCUSSION/SIGNIFICANCE OF IMPACT: In this cohort of New Mexicans with thyrotoxicosis, native American race was protective against thionamide-induced neutropenia.

2147

Relationships between medical complexity factors and medication confidence and adherence among older Singaporean adults

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OBJECTIVES/SPECIFIC AIMS: To investigate whether medical complexity (indicated by multiple providers or healthcare visits) is associated with lower levels of confidence in medication use and lower medication adherence METHODS/STUDY POPULATION: Data on socio-demographics, health encounters, health status, and health attitudes and behaviors from a nationally representative sample of 1575 older Singaporean adults were utilized. The

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association of medical complexity factors with self-reported medication confidence and adherence was analyzed using logistic regression analysis controlling for age, gender, ethnicity, education, and number of health conditions. RESULTS/ANTICIPATED RESULTS: The survey had a 60% response rate. The mean age of respondents was 72, and 42% were male. We found no significant association between number of visits and either confidence about usage (OR = 1.07, 95% CI 0.95–1.20) or medication adherence (OR = 1.01, 95% CI 0.90–1.13). We similarly found no significant association between number of providers and either confidence about usage (OR = 1.03, 95% CI 0.90–1.18) or medication adherence (OR = 1.05, 95% CI 0.93–1.20). Lower confidence about medication use was less likely among males (OR = 0.60, 95% CI 0.44–0.80), those with more education (OR = 0.29, 95% CI 0.20–0.42) or more comorbidities (OR = 0.89, 95% CI 0.82–0.96) and more likely with increasing age (OR = 1.06, 95% CI 1.04–1.08). Nonadherence was more likely among Indians (OR = 1.62, 95% CI 1.06–2.48) and those with more comorbidities (OR = 1.10, 95% CI 1.02–1.18). DISCUSSION/SIGNIFICANCE OF IMPACT: Having more healthcare visits or providers were not independent correlates of lower medication confidence or adherence. Seniors with less education may benefit from interventions to improve confidence about medication use. Participants with more comorbidities expressed greater confidence but admitted to lower adherence. The role of other potential contributors to nonadherence in complex patients (eg, cost and access, patient preference, competing demands) should be evaluated next.

2152

Adipose tissue measurements of computed tomography scan studies as a possible predictor of cancer recurrence after radical prostatectomy

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OBJECTIVES/SPECIFIC AIMS: The goal of this pilot study is to provide a reliable anatomical algorithm for the measurement of adipose tissue within the pelvic cavity as a predictor of prostate cancer aggressiveness and recurrence after radical prostatectomy. METHODS/STUDY POPULATION: We will conduct a retrospective analysis of men treated with radical prostatectomy between 2012 and 2016 at the VA Caribbean Health Care System. Clinical variables, pathology reports, and computed tomography will be reviewed. Pelvic and periprostatic fat (PF) will be measured to determine association between PF and cancer aggressiveness and recurrence. RESULTS/ANTICIPATED RESULTS: We expect a positive association between PF and cancer aggressiveness and recurrence among patients who underwent radical prostatectomy. DISCUSSION/SIGNIFICANCE OF IMPACT: Measurement of subcutaneous and PF within the pelvic cavity can provide a reliable anatomical measure which can be used as a proxy measure to identify those with higher risk of recurrence and develop better prevention and treatment strategies, especially in Hispanic men.

2162

The impact of *Clostridium difficile* infection on disease severity in patients with inflammatory bowel disease

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OBJECTIVES/SPECIFIC AIMS: Inflammatory bowel disease (IBD) patients are at an increased risk of *Clostridium difficile* infection (CDI) but the impact of CDI on disease severity is unclear. The aim of this study was to determine the effect of CDI on long-term disease outcome in a cohort of IBD patients. METHODS/STUDY POPULATION: We analyzed patients enrolled in a prospective IBD natural history registry. Patients who tested positive at least once formed the CDI positive group. We generated a 2:1 propensity matched control cohort based on risk factors of CDI in the year before infection. Healthcare utilization data (emergency department use, subsequent hospitalizations, telephone encounters), medications, labs, disease activity, and quality of life metrics were temporally organized. RESULTS/ANTICIPATED RESULTS: A total of 198 patients (66 CDI, 132 matched controls) were included [56.6% female; 60.1% Crohn's disease (CD), 39.9% ulcerative colitis (UC)]. Groups were not significantly different in the year before infection in all metrics but in the year of infection, having CDI was significantly associated with more steroid and antibiotic exposure, elevated C-reactive protein or erythrocyte sedimentation rate, and low vitamin D (all $p < 0.01$). Infection was associated with increased disease activity metrics (UC: $p = 0.036$, CD: $p = 0.003$), worse disease-related quality of life ($p = 0.003$), and increased healthcare utilization ($p < 0.001$). In the next year after infection those with prior CDI continued to have increased exposure to vancomycin or fidaxomicin ($p < 0.001$) and all other antibiotics ($p = 0.01$). They also continued to have more clinic visits ($p = 0.006$), telephone encounters ($p = 0.001$), and worse disease-related quality of life ($p = 0.03$), but disease activity and biomarkers of severity were not significantly different between groups. DISCUSSION/SIGNIFICANCE OF IMPACT: CDI infection in IBD is significantly associated with various surrogate markers of disease severity, increased healthcare utilization and poor quality of life during the year of infection. CDI patients continue to experience poor quality of life after infection with increased clinic visits and antibiotic exposure while disease activity is no longer significantly increased. These findings suggest that CDI infection may have a lasting effect on healthcare utilization beyond the acute treatment period.

2181

Patient preferences and attitudes regarding next-generation sequencing results: scoping review of the literature

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OBJECTIVES/SPECIFIC AIMS: Although the clinical utility of whole genome sequencing (WGS) is increasing, a gap exists between what WGS can deliver in quantity of genomic information and what results can be interpreted that patients and community members would find meaningful. Given the potential for incidental findings and variants of uncertain significance, an emphasis should be placed on understanding patient preferences towards receiving WGS results. To identify the current knowledge base on WGS preferences, we performed a scoping review. METHODS/STUDY POPULATION: A search on PubMed using terms "WES," "WGS," "genome sequencing," "attitudes," and "preferences" identified survey research between 2012 and 2016. Summaries of population, sample, variables, and results were tabulated. RESULTS/ANTICIPATED RESULTS: Of 13 studies identified, 6 surveyed community members, 6 included medical professionals, and 2 surveyed cohorts with a specific medical condition. Only 1 study used a nationally representative sample and no study focused on a medically underserved population. Patients were most interested in receiving medically actionable results, yet preferred to have access to all available data if desired. Genetics professionals are more conservative with the return of incidental and uncertain findings. DISCUSSION/SIGNIFICANCE OF IMPACT: Existing surveys have limited representation of the US public. Future studies focused on medically underserved populations would provide a deeper understanding of attitudes and preferences toward WGS.

2184

Evaluating the association among biological, social, and nutritional status on adolescent pregnancy rates, physiology and birth outcomes using electronic health records data

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OBJECTIVES/SPECIFIC AIMS: To build a multisite deidentified database of female adolescents, aged 12–21 years (January 2011–December 2012), and their subsequent offspring through 24 months of age from electronic health records (EHRs) provided by participating Community Health. METHODS/STUDY POPULATION: We created a community-academic partnership that included New York City Community Health Centers (n = 4) and Hospitals (n = 4), The Rockefeller University, The Sackler Institute for Nutrition Science and Clinical Directors Network (CDN). We used the Community-Engaged Research Navigation model to establish a multisite deidentified database extracted from EHRs of female adolescents aged 12–21 years (January 2011–December 2012) and their offspring through 24 months of age. These patients received their primary care between 2011 and 2015. Clinical data were used to explore possible associations among specific measures. We focused on the preconception, prenatal, postnatal periods, including pediatric visits up to 24 months of age. RESULTS/ANTICIPATED RESULTS: The preliminary analysis included all female adolescents (n = 49,292) and a subset of pregnant adolescents with offspring data available (n = 2917). Patients were mostly from the Bronx; 43% of all adolescent females were overweight (22%) or obese

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(21%) and showed higher systolic and diastolic blood pressure, blood glucose levels, hemoglobin A1c, total cholesterol, and triglycerides levels compared with normal-weight adolescent females ($p < 0.05$). There was a statistically significant association between the BMI status of mothers and infants' birth weight, with underweight/normal-weight mothers having more low birth weight (LBW) babies and overweight/obese mothers having more large babies. The odds of having a LBW baby was 0.61 (95% CI: 0.41, 0.89) lower in obese compared with normal-weight adolescent mothers. The risk of having a preterm birth before 37 weeks was found to be neutral in obese compared to normal-weight adolescent mothers (OR = 0.81, 95% CI: 0.53, 1.25). Preliminary associations are similar to those reported in the published literature. DISCUSSION/SIGNIFICANCE OF IMPACT: This EHR database uses available measures from routine clinical care as a "rapid assay" to explore potential associations, and may be more useful to detect the presence and direction of associations than the magnitude of effects. This partnership has engaged community clinicians, laboratory and clinical investigators, and funders in study design and analysis, as demonstrated by the collaborative development and testing of hypotheses relevant to service delivery.

2190

Collective capacity building tool (CCBT): A unique instrument and process supporting community-campus partnerships for translation

Kathryn Nearing, Donald Nease, Montelle M. Tamez, Martha Tenney and Elizabeth Sweitzer

OBJECTIVES/SPECIFIC AIMS: (1) Provide an innovative tool used to accelerate and evaluate T3-T4 research; (2) describe the collective capacity building tool (CCBT) methodology—both programmatic and evaluative applications; and (3) share insights about the process and outcomes of community-engaged research. METHODS/STUDY POPULATION: Academic and community-based partners complete the assessment together at the beginning and conclusion of their Community Engagement pilot projects. Further, they are encouraged to use the tool and the associated insights/priorities that emerge as the basis for data-driven coaching with Community Research Liaisons throughout the 12-month grant cycle. RESULTS/ANTICIPATED RESULTS: Pre/post results with 4 cohorts of pilot grantees consistently demonstrated the most positive change in relation to 1 item: overcoming previously identified barriers to community engagement (eg, language, mistrust, scheduling conflicts). Other key findings: (1) networks of reciprocal ties expand, providing structures to support dissemination of information and interventions. (2) Partners leverage expanded networks to pursue follow-on funding and extend the scope/reach of their efforts geographically and/or with new populations. (3) Projects enhance trust in the research process by developing group processes that facilitate the respectful sharing of diverse (often alternative) viewpoints and through culturally-responsive project implementation. DISCUSSION/SIGNIFICANCE OF IMPACT: The CCBT can be used at multiple points in time to help project partners achieve the deliberate integration of CBPR principles in practice and advance community-engaged translational research efforts for sustainability and scalability. The CCBT is sensitive enough to document the iterative nature of partnership development and CBPR. An example: a great deal of variability was found in how formally partners defined roles. Further, partner roles often changed as projects evolved. Still, results indicated a general trend toward achieving greater clarity in partner roles over time. Further, the tool captured set-backs due to partner turn-over and partnerships regaining momentum after new staff came on board. Results have strong face validity: more mature partnerships reported stronger community connections and previous successes to build upon. Perhaps most importantly: the tool and associated process was well-received by academic and community-based partners alike.

2191

The SDM learning loop model

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OBJECTIVES/SPECIFIC AIMS: (1) To propose an iterative decision-making model of care planning for CSHCN. (2) To identify targets warranting measurement in future studies of SDM in care planning for CSHCN. METHODS/STUDY POPULATION: Conceptual model developed by a multi-disciplinary team iteratively considering the complex relationships among diverse factors affecting care planning for CSHCN, informed by clinical and implementation science experience and a scoping literature review of medical and cognitive sciences literature addressing interpersonal decision-making, communication, negotiation, and trust among children, their parents, and their clinicians. RESULTS/ANTICIPATED RESULTS: Decision-making interventions in pediatrics tend to focus narrowly on single acute decisions, providing minimal guidance for decisions related to chronic disease management over time. Few models account for the role of the child in the decision-making process, despite their ongoing development. Therefore, we propose a model of shared decision-making in the context of managing chronic illness in children that recognizes all actors and can support both the design of clinical care and research. This model —The SDM Learning Loop Model—highlights the dynamic iterative nature of exchanges between and among the clinical team and the parent-child dyad and recognizes the child as the center of each decision-making cycle. The model accounts for key practice, family, experiential, and emotional contexts influencing the decision-making encounter. In this model, change in child health status and developmental capacity resulting from a given cycle's care plan will directly influence the relationship between clinician and parent-child dyad (eg, mutual trust, attunement) and impact each party's engagement in the next round of decision-making. The relationship between experience and outcome stimulates learning. DISCUSSION/SIGNIFICANCE OF IMPACT: Our proposed SDM Learning Loop Model suggests that increasing the shared nature of decision making is not only likely to optimize care planning, but creates "buy-in" that can both reinforce the impact of positive outcomes, and moderate the negative impact on relationships when the outcome is other than desired. We hypothesize that this model can guide care planning and shape research to the benefit of both clinical outcomes and clinician-family relationships. Future work should focus on the development and validation of measures to account for the experiential and emotional contexts in which such decisions are made, and the outcomes of care in this population.

2248

Screening for diabetes in high-risk women: Building the data infrastructure to study postpartum diabetes screening among low-income women with gestational diabetes

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OBJECTIVES/SPECIFIC AIMS: Women with GDM have a 7-fold higher risk of developing T2DM, and rates of GDM are higher among racial and ethnic minorities and women of lower socio-economic status. There are no data on postpartum diabetes screening after the first postpartum year or among women receiving care in FQHCs. We aim to address this gap in the literature by (1) defining the rates of follow-up screening for T2DM at 6–12 weeks and 1–3 years postpartum and (2) characterizing patient, provider, and healthcare system attributes that are associated with lack of follow-up screening for T2DM in a population of low-income women with GDM. METHODS/STUDY POPULATION: This is a retrospective cohort study of women with GDM during pregnancy receiving care in Missouri FQHCs from 2010 to 2015. Electronic health records (EHR) data from 26 FQHCs is housed in a central repository through the Missouri Primary Care Association (MPCA). This includes patient demographic, lab, and medication information as well as encounter level patient and provider data for the prenatal and postpartum period. EHR data does not include accurate delivery information, however. Pregnancies during the study time frame were identified using CPT and ICD9/10 codes. Deidentified data on individuals with a pregnancy was utilized to identify a subpopulation of "GDM candidates," using a broad definition of glucose abnormalities as follows: ICD-9/ICD-10 codes for diabetes, medications and testing supplies used for diabetes, infant birth weight ≥4000 g or 8 lb or 13 oz, or abnormal glucose labs [defined as fasting glucose ≥ 95, gestational glucose screen ≥ 130, 1 h test ≥ 130 (or ≥180 if 2 h test and 3 h test recorded on same day), 2 h test ≥ 155, 3 h test ≥ 140, A1C ≥ 6, any glucose ≥ 130, or any positive urine glucose]. This subpopulation was then linked to Medicaid administrative claims data [housed at the University of Missouri Office of Social and Economic Development Analysis (OSEDA)], providing detailed information on delivery, to further characterize patients with GDM in the time frame and provide all dates necessary to classify pregnancy and postpartum periods. RESULTS/ANTICIPATED RESULTS: From the de-identified pregnancy data set including 45,810 individuals, we identified 8008 "GDM candidates." EHR data were linked to Medicaid claims data for these individuals from 2010 to 2015. Utilizing the enhanced data set, we are defining a pregnancy for each individual by the delivery date in the Medicaid record and an algorithm using lab and ultrasound record dates to define gestational age at delivery. This will result in a pregnancy level data set linked with individual encrypted identifiers with each record representing 1 pregnancy and postpartum period. GDM in pregnancy will be

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defined as having a baby with birth weight ≥ 4000 g or 8 lb or 13 oz, ICD-9 or ICD-10 code for GDM during pregnancy or at delivery, or an oral glucose tolerance test (oGTT) 12–16 weeks before delivery with 2 or more abnormal results by Carpenter and Coustan criteria. We anticipate that our final GDM data set will include 2000–3000 individuals. We will then calculate the percentage of individuals receiving recommended screening tests at 6–12 weeks (fasting glucose or 2 h oGTT) and 1–3 years postpartum (fasting glucose, 2 h oGTT, HbA1C). We will use multivariable regression techniques to identify risk factors for lack of screening. We will be able to incorporate predictors not previously evaluated including distance from home to health center, access to public transport, specialty and training of the patient's providers, pregnancy weight gain, postpartum appointment time of day, and number of various types of office visits. DISCUSSION/SIGNIFICANCE OF IMPACT: The creation of a linked data set of pregnancies complicated by GDM in women receiving care in FQHCs in Missouri is the first step toward better characterizing follow-up diabetes screening rates in this population and understanding patient, provider, and healthcare system variables that affect postpartum screening. The ultimate goal is to translate evidence-based patient-centered sustainable interventions into practice for low-income women with a history of GDM and improve population outcomes with the ability to track progress prospectively over time.

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2252

Decreasing loss to follow up after surgery for meningioma

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OBJECTIVES/SPECIFIC AIMS: "Loss to follow up" is a common phenomenon and challenge in clinical medicine. Missed appointments are a well-documented source of waste in the health care system, and can lead to strained patient-physician relationships and inferior quality of care. Meningiomas are relatively common, benign tumors that arise from the dural coverings of the brain. Although complete surgical resection is considered curative, surgically excised meningiomas have a well-documented propensity to recur, necessitating continued imaging surveillance of postresection patients. A recent retrospective study at our institute demonstrated that 20% of postresection patients fail to return for follow up within a year of their surgery. Although social determinants of health have been associated with failure to follow up in this population, there has been no research identifying patient-reported barriers that result in loss to follow up in this patient population. The purpose of this study is to identify specific barriers that prevent patients from returning for surveillance. METHODS/STUDY POPULATION: We used an IRB approved, prospective brain tumor clinical database to identify patients who underwent surgical resection of intracranial meningioma at our institution between 2001 and 2013. "Loss to follow up" was defined as failure to attend follow-up appointments with neurosurgery, radiation oncology, or neuro-oncology within a year of the most recent assigned follow-up interval, as recorded in the electronic medical record. Structured interviews were conducted with patients who met study criteria and specific barriers to follow-up were elicited, transcribed, and coded. In 2 cases, a primary caregiver participated in all or portions of the interview with the patient. A general assessment of patient knowledge about meningioma and a screening for basic health literacy were also conducted. RESULTS/ANTICIPATED RESULTS: There were 80 patients in the brain tumor clinical database met chart review criteria for inclusion in the study. A total of 9 structured interviews were conducted; 1 interview was excluded from analysis for failure to meet study criteria. In total, 24 unique obstacles to follow up were recorded. These were stratified and grouped into 4 broad categories: 2 of 8 (25%) patients identified environmental factors, including distance to appointment and challenges with insurance coverage as barriers to follow up; 2 patients (25%) identified psychosocial factors, including poor communication with and distrust of their neurosurgeon as barriers to follow up; 2 (25%) patients identified health factors, including poor health and old age, as barriers to follow up; 6 patients identified healthcare systems factors as barriers to follow up, with 6 patients (75%) reporting seeing a non-specialist for follow up after surgery and 4 patients (50%) reporting not being told by their neurosurgeon that they would need continued follow up. Of those patients seen by non-specialists, only 1 reported any recent brain imaging by those providers. All patients had limited to no prior knowledge of meningiomas before their diagnosis. Four (50%) patients reported satisfaction with the level education about meningiomas they received from their physician. Of these patients, 3 (75%) correctly reported that meningiomas may recur following surgery. Of the patients who did not report satisfaction with physician counseling, 3 (75%) did not realize that meningiomas can recur. DISCUSSION/SIGNIFICANCE OF IMPACT: Healthcare system factors, including uncoordinated transition of postoperative care to non-neurosurgeons and uncertain postoperative surveillance schedules, represent that most common patient-identified barriers to follow up after meningioma resection. Improving transition of care from specialists to non-specialists, including designation of appropriate imaging surveillance schedules, as well as improving communication between specialists and patients about the need for continued follow up, represent clear points for intervention that could improve care for this patient population. In addition, consistent and clear counseling about meningioma and its disease course may reduce loss to follow up following meningioma resection. It is important to note, however, that the small sample size represents a significant limitation of the study.

2261

Incidence and predictors of noncompliance with evidence-based guidelines for early stage breast cancers using the National Cancer Data Base

Albert Liao, Grant W. Carlson, John William Eley and Theresa W. Gillespie

OBJECTIVES/SPECIFIC AIMS: Evidence-based guideline-concordant care leads to better outcomes in patients with early stage breast cancer, including survival. However, previous studies of guideline compliance have been limited by small study sample sizes, localized geography, unknown causal factors, and lack of diverse population. We use a national database to assess socio-economic, clinical, and facility factors that impact treatment compliance with evidence-based guidelines from the American Society of Clinical Oncology (ASCO) and the National Comprehensive Cancer Network (NCCN). METHODS/STUDY POPULATION: This is a retrospective cohort study of the National Cancer Data Base Participant User File Breast 2014, which captures ~70%–80% of all newly diagnosed cancer cases in the United States. Female patients who were diagnosed with early stage breast adenocarcinoma (T0, T1, T1A, T1B, 2, 2A, or T2N1) from 2004 to 2014 were eligible for this study. RESULTS/ANTICIPATED RESULTS: A total of 807,314 patients were included in this study. Evidence-based guidelines examined with associated compliance rates include surgery completion (79.3% overall compliance), breast conserving surgery Versus mastectomy (88.05% vs. 11.95%, respectively), radiation after breast conserving surgery (77.5% overall compliance), HER2 testing (88.6% overall compliance), estrogen/progesterone receptor (ER/PR) testing (96.3% overall compliance), hormone treatment for positive ER/PR breast cancer (80.2% overall compliance), and sentinel lymph node biopsy completion (67.5% overall compliance). Univariate association between these guidelines and covariates such as facility type, facility location, age, race, insurance status, median income quartiles, achievement of high school degree, urban Versus rural, Charlson-Deyo score, year of diagnosis, and overall survival were assessed. Logistic regression analysis will be used to determine multivariate relationships between these characteristics and the probability that a patient will be compliant to guideline regimen. DISCUSSION/SIGNIFICANCE OF IMPACT: The results of this study will help identify socio-economic, clinical, and facility factors that influence guideline-concordant care and subsequent critical outcomes for patients with early stage breast cancer. Lack of guideline concordant care for specific stages of cancer or treatment modalities will point to a need for tailored interventions to enhance compliance. A prediction model will help identify the most important predictors of noncompliance in breast cancer treatment so noncompliance can be prevented in at-risk populations.

2283

Brain thermometry to detect neuroinflammation in traumatic brain injury

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OBJECTIVES/SPECIFIC AIMS: In this pilot study, we are testing a new approach for detecting neuroinflammation in individuals who have sustained a traumatic brain injury (TBI). We hypothesize that many long-term adverse consequences of TBI are driven by abnormal inflammatory processes in the brain that occur secondary to the original neural injury. This inflammation can spread well beyond the damaged tissue and cause profound fatigue, widespread pain, cognitive impairment, and depressed mood. METHODS/STUDY POPULATION: Using a technique based on magnetic resonance spectroscopy, we can obtain precise and accurate temperature measurements throughout the human brain, which may serve as a proxy for neuroinflammation. In this study, we examine 20 men who have sustained a moderate-to-severe TBI and 10 age-

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matched healthy men without history of TBI. Temperature is assessed on a voxel-by-voxel basis throughout the entire brain. Cognitive ability is measured with the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Information on pain, fatigue, and mood is collected through questionnaire. RESULTS/ANTICIPATED RESULTS: We anticipate that (1) average whole-brain temperature will be significantly higher in the TBI group than the healthy control group; (2) severity of (a) pain, (b) fatigue, and (c) mood symptoms will be correlated with brain temperature; and (3) severity of cognitive impairment will be correlated with brain temperature. DISCUSSION/SIGNIFICANCE OF IMPACT: If the hypotheses are confirmed, this tool will fill a need for objective tests of TBI pathology that can be used to improve diagnostic and treatment decisions and predict long-term functioning. This test would be the first completely noninvasive tool for detecting neuroinflammation, and will allow for safe and inexpensive longitudinal testing. Ultimately, we hope this noninvasive scanning technique will accurately track neuroinflammation in TBI, leading to more targeted and effective treatments.

2313

A path perspective on bio-psychosocial predictors of health status in peripheral arterial disease

Nikhil Satchidanand, Jeffrey Fine and Gregory S. Cherr

OBJECTIVES/SPECIFIC AIMS: To explore associations among bio-psychosocial factors predictive of overall physical and mental health status as assessed using the SF-12 Health Survey. METHODS/STUDY POPULATION: Community-dwelling, male and female elders with peripheral arterial disease (PAD) were administered an assessment battery to identify factors associated with self-assessed physical and mental health status using the SF-12 Health Survey. The battery included an assessment of pain, depressive symptoms, perceived social support, perceived psychological stress, physical function, as well as selected demographic variables. RESULTS/ANTICIPATED RESULTS: Preliminary linear regression analyses have identified several factors predictive of physical and mental health status including depressive symptoms, pain, perceived stress, and physical function. A more in-depth examination using path analysis is anticipated to reveal important mediational associations, wherein physical function is a strong mediator between bio-psychosocial factors and overall physical and mental health status. DISCUSSION/SIGNIFICANCE OF IMPACT: Aging is often associated with a reduction in physical and mental well-being, frequently exacerbated by the development and progression of chronic disease. PAD is a common chronic condition that places significant burden on the older patient and their family. Identifying and developing a more in-depth understanding of the factors that impact health status in PAD is an important and timely objective. We anticipate that our findings will inform development of more targeted and effective intervention strategies we can employ to improve the quality of life among elders struggling to manage PAD.

2318

"A clash of cultures": Cervical cancer screening and Hispanic males

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OBJECTIVES/SPECIFIC AIMS: Focus groups are being conducted to describe and identify barriers and/or facilitators to Hispanic males' health literacy, culture, and language related to cervical cancer prevention practices METHODS/STUDY POPULATION: A purposive convenience sample was recruited to participate in focus group sessions with English or Spanish speaking Hispanic males 21 years of age and older. Groups were segmented by age (21–29, 30–39, 40–49, and 50–65), and language (English or Spanish). Focus group discussions (n = 8) were led by a bilingual/bicultural female researcher using a discussion guide that followed Zarcadoolas *et al.* (2005) health literacy model 6 as related to their partners' cervical cancer screening and prevention practices. All sessions were audio-recorded and transcribed verbatim. Participants completed standardized questioners regarding demographic data and their health literacy. Qualitative content analysis was used for analyzing focus group interviews. RESULTS/ANTICIPATED RESULTS: Preliminary qualitative analysis shows the struggle Hispanic males' face accepting cervical cancer screening for their female partners. One participant reported that it was "a clash of cultures." A "clash of cultures" was described as a constant struggle and acceptance between science, personal knowledge, and Hispanic cultural taboos. DISCUSSION/SIGNIFICANCE OF IMPACT: Hispanic male's health literacy, communication, language preferences, and cervical cancer risks, will further enhance the knowledge needed to design intervention measures for cancer prevention among Hispanics. Understanding the factors that contribute to the unequal burden of cervical cancer incidence and mortality among Hispanic women in South Texas is critical to prevent cervical cancer among this population.

2329

Psychosocial risk factors mental health symptoms, and intervention preferences of Latino immigrant parents presenting to a pediatric clinic

Rheanna Platt and Elisabet Arribas-Ibar

OBJECTIVES/SPECIFIC AIMS: (1) To assess the prevalence of mental health symptomatology (depressive symptoms, anxiety symptoms, PTSD symptoms, and problematic alcohol use) and psychosocial risk factors for mental health disorders (low social support, immigration stress, acculturation, and marital/partner discord), and their association with immigration status, health care access and contextual risk factors in Spanish-speaking parents of young children (ages 0–5) who attended a well-child visit. (2) To explore acceptability of screening for and discussing parental distress in the pediatric primary care setting, and parental acceptability of a group well-visit format to address both psychosocial risk factors and mental health symptoms in this population. METHODS/STUDY POPULATION: Latino immigrant parents (n = 100) of children ages 0–5 attending well-child visits at Johns Hopkins Bayview Children's Medical Practice were surveyed between October 2015 and February 2016. The verbally administered survey included the Woman Abuse Screening Tool (WAST), AUDIT-C, Primary Care Post-Traumatic Stress Disorder (PC-PTSD) Screener, California Health Interview Survey (CHIS), National Latino and Asian American Study (NLAAS), Appraisal Support Subscale from Interpersonal Support Evaluation List (ISEL), Personal Health Questionnaire Depression Scale (PHQ-8), and Generalized Anxiety Disorder Scale (GAD-2). These questionnaires have been used in large regional or national surveys and most have been validated with US Latino populations. Positive screens were defined as PHQ-8 > 5 (mild depression or greater), GAD-2 > 3, AUDIT-C > 3 for women and >4 for men, and PC-PTSD > 3. Descriptive information and comparisons were obtained by χ^2 and Student *t*-test. Study protocol will allow review of childrens' pediatric records (n = 100). From this sample, parents were separately recruited to participate in in-depth interviews (n = 11 of 20 planned have been completed) further exploring both sources of parental distress, acceptability of screening for parental mental health symptoms in the primary care pediatric setting, and acceptability of a potential group-based well-visit model in the pediatric setting. RESULTS/ANTICIPATED RESULTS: Survey participants were 93.0% women, and predominantly < 35 years of age. The vast majority (94.0%) were undocumented, recently arrived (<15 years ago) and reported poor or very poor English proficiency (75.0%). Most (84.7%) reported living with a partner or spouse (84.7%), and 58% reported partner relationship strain. In all, 71% reported poor social support. The prevalence of "screen positive" mental health symptoms was highest for depression (55%) and PTSD (35%), followed by anxiety (29%) and alcohol risk use (25%). Having depression was significantly higher (68.4%) ($p < 0.02$) in participants with less education (<6 grade). Partner relationship strain was associated with a higher prevalence of depressive symptoms (59.3%) ($p < 0.03$). Immigration stress (feeling guilty for leaving family and friends) was also significantly associated with depressive symptoms (58.1%) and PTSD (43.5%) ($p < 0.03$). More than half of the participants (60.0%) with depression were not covered by any health insurance and 56.3% of those with depression reported not having been seen by a health care provider in the past 12 months. A high prevalence of symptoms was found in those with poor appraised social support: alcohol risk use (76.0%), depression (69.1%), anxiety (69.0%), and PTSD (68.6%). Among participants, those aged < 30 years old and those with more children reported poorer appraised social support. Data from child medical records (including BMI, presence of feeding problems, referrals for social work, or mental health services) has been extracted but not yet linked to parent survey or interview results. Preliminary review of In Depth Interviews suggests that the most common reported source of stress among participants was related to finances, followed by documentation/legal status difficulties, access to childcare, and limited English proficiency. Some mothers also mentioned interpersonal violence and lack of access to healthcare as stressors. All mothers expressed an interest in a pediatric primary care based parent focused the majority of which indicated that a group based intervention would be acceptable, some mothers indicated they preferred a one-to-one intervention if mental health were to be discussed. Mothers seem preferential to social worker-led interventions compared with pediatrician-led, but most mothers were indifferent. Finally, mothers expressed low support from the Latino community in Baltimore. DISCUSSION/SIGNIFICANCE OF IMPACT: Results from this study suggest that this population of parents is experiencing a relatively high rate of mental health symptoms, low perceived social support, and limited access to their own source of care. This suggests that an intervention delivered within a primary care pediatric setting would have the potential to reach parents who might not otherwise interact with

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their own providers, and that there are an array of problems that could be targeted. Intervening with parents of young children has the potential to affect multiple child outcomes. A group intervention may target poor social support, though this format is not universally preferred. Next steps for this project include assessing the acceptability of and preference for various content components (ie, depression, parenting stress, legal issues) and linking parent data with child data (including developmental screening results, weight, feeding problems, and behavior problems).

2332

Community engagement in clinical and translational research: A framework for research institutions

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OBJECTIVES/SPECIFIC AIMS: Community engagement is a commonly used term, but is complex in both meaning and application. In order to help academic institutions and administrators develop infrastructure to promote and support community engagement and to help investigators work productively with communities, this analysis discusses the major components of community engagement in research on both the institutional and individual project levels as well as the interplay between them. METHODS/STUDY POPULATION: A literature synthesis conducted by a community engagement in research committee at 1 CTSA institution that examined the myriad factors related to effective community engagement in research identified across multiple disciplines was used to distill the major factors identified, assesses the interplay of the identified factors, and produce a conceptual model to help administrators and investigators apply best practices in engaging communities in clinical and translational research. RESULTS/ANTICIPATED RESULTS: This work takes a concept—community engagement in research—that is often stated and discussed, but is highly complex and challenging to implement—and identifies and discusses the multiple, interrelated factors germane to it. The model illustrates that while community engagement in research is implemented in the context of individual projects, a deep and continual interplay between individual projects and the goals, capacity, and policies of research institutions is needed for rigorous, ethical, and effective community engagement. DISCUSSION/SIGNIFICANCE OF IMPACT: Results are presented through a conceptual framework which displays the major components needed for rigorous, ethical, and effective community engagement in clinical and translational research. In addition, the conceptual framework presented will provide assistance to those developing approaches to measure and evaluate institutional readiness for community engagement in research as well as the effectiveness of individual community engagement efforts.

2333

Examination of barriers and facilitators to sexual healthcare access among adolescent Latinas in Alabama

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OBJECTIVES/SPECIFIC AIMS: Alabama (AL) experienced a 145% increase in its Latino population between 2000 and 2010; making it the state with the second fastest growing Latino population in the United States (US) during that time. Adolescent Latinas in the US and in AL are disproportionately affected by sexual health disparities as evidenced by the disproportionate burden of HIV, STIs and early pregnancy compared with their non-Hispanic, White counterparts. Empirical data with adult Latinas in the southeast suggest significant barriers to sexual healthcare access. However, to our knowledge, no other researchers have examined barriers and facilitators to sexual healthcare access for this subpopulation. Therefore, the purpose of this study is to examine adolescent Latinas' sexual healthcare needs through in-depth qualitative interviews. These qualitative interviews (phase 1 of a 3-phase study) will inform the development of community-driven, theory-based, culturally-relevant, multi-level intervention strategies to reduce sexual health disparities and increase sexual healthcare access for this group. Community-based participatory research (CBPR), which ensures equitable participation of stakeholder groups through partnerships, and the socioecological model of health, which conceptualizes the individual as nested within a set of social structures, provide the philosophical and theoretical frameworks for the work. METHODS/STUDY POPULATION: Between January and March of 2017, we will conduct 30 qualitative interviews with eligible adolescents who: self-identify as Latina, are between 15 and 19 years old, have been in the US for over 5 years, and live west AL. We will use venue-based, purposeful convenience sampling to recruit participants. We will manage and analyze the data with the qualitative software NVivo 10. We will use a multi-step, consensus-based process to code and analyze the interviews in the language in which they were conducted (ie, Spanish or English). We will maintain detailed audit trails during the analysis process and seek an inter-rater reliability of 0.85. RESULTS/ANTICIPATED RESULTS: We expect to identify barriers and facilitators to sexual healthcare services at distinct levels of the socioecological model of health. Study results and implications for practice in clinical settings will be discussed in detail. DISCUSSION/SIGNIFICANCE OF IMPACT: The proposed research is significant because (1) the state of AL experienced a dramatic increase in its Latino/a population over the last 15 years and adolescent Latinas in AL are disproportionately affected by sexual health disparities; (2) to our knowledge, this will be the first study to examine the multi-level factors associated with sexual healthcare access for adolescent Latinas in the South and inform intervention strategies to promote sexual healthcare access in this population; (3) the work will be conducted under the philosophical lens of CBPR such that community members will be involved in every step of the research process, resulting in culturally relevant intervention strategies.

2342

How interruptions affect the triage process in the emergency department

Kimberly D. Johnson, Gordon L. Gillespie and Kimberly Vance

OBJECTIVES/SPECIFIC AIMS: The aim of this study was to determining how interruptions affect the triage process. METHODS/STUDY POPULATION: Prospective, observational study, where 118 triage interviews were observed. RESULTS/ANTICIPATED RESULTS: In total, 57% of triage interviews were interrupted. The most common interruption was by other nurses; however, 7% of the interruptions were by the triage nurse themselves. When an interruption occurred during the triage process, 67% of the time the triage nurse would stop the triage assessment and attend to the interrupter. In the interrupted interviews, 17% of the entire triage time was dedicated to addressing interruptions. Some interruptions (ie, additionally staff entering to conduct ECG) had a positive impact by expediting care during the triage process; where other interruptions delayed patient care. DISCUSSION/SIGNIFICANCE OF IMPACT: Interruptions increased the total triage time and contributed to patient treatment delays, as well as led to errors in nursing assessment. Understanding the classifications of triage interruptions and the impact on patient outcomes will allow researchers to develop interventions to mitigate the impact of these interruptions.

2349

Development of a Pediatric Hydrocephalus Severity Index to predict long-term clinical outcomes

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OBJECTIVES/SPECIFIC AIMS: To create a composite index, referred to as the Pediatric Hydrocephalus Severity Index (PHSI), to classify the severity of disease at baseline and predict outcomes among children treated for hydrocephalus. METHODS/STUDY POPULATION: The Hydrocephalus Outcome Questionnaire will be administered in person or online to the parents of 150 patients between the ages of 5 and 18 years who are followed at the Neurosurgery Clinic at St. Louis Children's Hospital for hydrocephalus. Patients must have been diagnosed and treated for hydrocephalus at least 6 months prior to the survey date. Potential participants are excluded if their health status changed during the 4 weeks prior to survey date, as determined by the child's parents. Potential risk factors (see anticipated results) will be identified on retrospective medical record review. We will create a clinical prediction rule, called the PHSI, to stratify patients on likelihood of experiencing a poor long-term outcome after surgical treatment. Participants will be classified as "good" or "poor" outcome based on thresholds set for questionnaire results. We will use a combination of bivariate analysis and clinical reasoning to restrict the number of factors for further analysis, and multivariate logistic regression to build a predictive model for poor outcome. Creation of the PHSI will involve assigning integer values to adjusted odds ratios for significant risk factors at a 95% confidence level. RESULTS/ANTICIPATED RESULTS: Risk factors that we anticipate will be predictive of long-term clinical outcome include signs and symptoms at onset (bulging fontanel, splayed sutures, papilledema, up-gaze palsy, headache, vomiting, lethargy), head circumference above the 97th percentile, frontal-occipital horn ratio greater than 0.4, etiology of meningitis or neonatal intraventricular hemorrhage, central nervous system comorbidities (seizures, Chiari malformation, scoliosis, periventricular leukomalacia), pre-operative infection or sepsis, and frequent shunt revisions or infections. We

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hypothesize that a PHSI will be a valuable tool for stratifying patients in future research studies, as well as aiding prognosis in clinical situations. DISCUSSION/SIGNIFICANCE OF IMPACT: A validated composite PHSI would be a major advance in clinical hydrocephalus research and practice. A PHSI would allow investigators to stratify patients based on initial presentation for clinical research studies, which may in turn lead to the establishment of more standardized treatment guidelines. It would also facilitate studies investigating differential utilization of healthcare resources based on disease severity. Clinically, a PHSI would better equip physicians to counsel parents on what to expect for their child or future healthcare resource requirements.

2365

PTSD: Understanding differences in trauma cognitions, memory, and emotional regulation

Ellen Volpe, Tiffany Jenzer, Lauren Rodriguez and Jennifer P. Read

OBJECTIVES/SPECIFIC AIMS: Low-income, urban adolescents experience high rates of interpersonal and community violence and consequently post-traumatic stress disorder (PTSD). Memory theory purports that the development of PTSD can be explained by dysfunctional trauma cognitions, high sensory and poor articulation of trauma memories, and poor emotional regulation. The purpose of this paper are as follows: (1) to describe trauma experiences and PTSD symptoms of a high-risk sample of low-income urban youth and (2) to explore if post-traumatic cognitions, trauma memory quality, or emotional regulation means differ in participants screening positive for PTSD as compared with those that did not screen positive. METHODS/STUDY POPULATION: A preliminary sample of low-income, urban adolescents (ages 16–21) at risk for homelessness took a web-based, self-report survey responding to questions related to their experiences of trauma and mental health (n = 48). PTSD was measured with the PTSD Checklist for DSM-5 criteria (PCL_5). A cut-off of 33 was used as a positive screen for PTSD. Post-traumatic cognitions was measured with the post-traumatic cognition inventory (pcti) with higher scores representing greater dysfunctions and negative cognitions. Trauma memory was measured with the Trauma Memory Quality Questionnaire (TMQQ) with higher scores representing more sensory-based and poorly verbalized memories. Emotional regulation was measured using the Difficulties in Emotional Regulation Scale (DERS) with higher scores representing greater difficulties with emotional regulation. All 3 variables conceptually represented theoretical constructs of the development of PTSD. Initial data from the baseline survey was used conducted a 1-way ANOVA to compare the difference in post-traumatic cognition, quality of trauma memory, and emotional regulation in those that screened positive for PTSD as compared with their peers. RESULTS/ANTICIPATED RESULTS: The majority of this population (80%) experienced at least 1 traumatic life event. This sample experienced an average of 10.5 lifetime traumas (SD = 10.6). Of those experiencing trauma about 20% (n = 8) reported a positive PTSD screen (PCL-5). There were significant group differences among those screening positive for PTSD and their peers in the following variables: (1) pcti ($F_{1,24} = 10.43$, $p < 0.004$), (2) TMQQ ($F_{1,29} = 11.02$, $p < 0.002$), and (3) DERS ($F_{1,36} = 19.68$, $p = 0.000$). The majority of this population (80%) experienced at least one traumatic life event. This sample experienced an average of 10.5 lifetime traumas (SD=10.6). Of those experiencing trauma about 20% (N=8) reported a positive PTSD screen (PCL-5). There were significant group differences among those screening positive for PTSD and their peers in the following variables: 1) pcti [F(1,24) = 10.43, p<.004], 2) TMQQ [F(1,29) =11.02, p<.002], [F(1,36) =19.68, p=.000]. DISCUSSION/SIGNIFICANCE OF IMPACT: This sample reported high rates of trauma and PTSD. Constructs representing memory theory (cognition dysfunction, quality of memory, and emotional regulation) all significantly differed among participants with PTSD compared with their peers. Consequently, it may be useful for trauma interventions to target the maladaptive post-traumatic cognitions, quality of traumatic memories, and emotional regulation in this population. These results will inform work that aims to explore if a trauma intervention, based on the memory theory can improve PTSD symptoms. Anticipated data collection completion in March 2017 (n = 120).

2377

"Pipa" means early death: Obesity and cardiovascular disease (CVD) risks perception, knowledge and behavior among minority NYC cab drivers— A qualitative analysis

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OBJECTIVES/SPECIFIC AIMS: More than 2 out of 3 adults in the United States are overweight or obese. Obesity disproportionately affects minority populations. There is limited data on obesity and CVD risks among inner-city minority cab drivers in New York City (NYC). The goal is to study perceptions, knowledge and health behaviors of Hispanic livery cab drivers of NYC that contributes to obesity. METHODS/STUDY POPULATION: We conducted an observational study of focus groups related to perception, knowledge, or behavior among Latino livery cab drivers of NYC. Direct transcription of the taped recordings into concepts were grouped into themes and common themes were categorized. The sample size of the focus groups was based on the saturation point where common themes emerged. RESULTS/ANTICIPATED RESULTS: In total, 25 Latino livery cab drivers were enrolled. Of those, 24 were men. Mean age is 53 years (21–69); body mass index (BMI) is 31 (22.8–38.7) kg/m^2; 50% had hypertension and 27% had diabetes. Eight dominant themes emerged. Cab drivers were aware of their increased risk for CVD which most of them attributed to work stress, sedentary lifestyle, and poor eating habits "on-the-go". In particular, they mentioned a tendency of having "Pipa," a Spanish term denoting increased abdominal girth, which they equated to early death. Family and social support was an important facilitator in changing unhealthy behaviors. DISCUSSION/SIGNIFICANCE OF IMPACT: Our study shows that minority cab drivers are generally obese or overweight and aware of their personal risk factors for CVD including central obesity. Social and family support may be key to improving their lifestyle. An evidenced-based health model that includes family education and decision support will be tested in our next study phase to understand if it can improve body weight.

2381

Characterizing delayed transition to adult care in children with chronic kidney disease

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OBJECTIVES/SPECIFIC AIMS: As part of a larger effort to create a longitudinal record of care for patients with chronic kidney disease (CKD) in Delaware, we assessed transitions of care from pediatric to adult care. This study examined the length of time between last pediatric contact and first contact in the adult system in order to determine characteristics associated with delayed transition to adult care. METHODS/STUDY POPULATION: Patients who receive pediatric care at the Nemours/Alfred I. duPont Hospital for Children (Nemours) are transitioned to adult care between the ages of 18 and 21. Our study population consists of all patients seen in the Nephrology unit at Nemours for CKD, hypertension (HTN), or diabetes who turned 21 years old between 2007 and 2013. Records of office visits from Nemours, Christiana Care Health System (CCHS), and Nephrology Associates, P.A. (NAPA) were transformed into the OMOP common data model and merged. Patients who had at least 1 record in the Nemours EHR of pediatric care before age 21 and had at least 1 record in the CCHS or NAPA adult EHRs were considered transitioned. To identify characteristics associated with delayed transition to adult care, we compared gender, race, ethnicity, age, comorbidities, and level of kidney function at the last pediatric visit between patients whose transition gap was less than 1 year and patients whose gap was 1 year or more. Kidney function was estimated by calculating glomerular filtration rate (GFR). Nemours estimates GFR in children using the revised Schwartz equation, which is based on serum creatinine and height. To calculate adult GFR, we used the CKD-Epi equation, which is based on serum creatinine, age, sex, and race and is widely used to derive adult GFR. As kidney function declines, GFR decreases. We used Fisher exact test to compare categorical variables and *t*-test to compare age and GFR. RESULTS/ANTICIPATED RESULTS: We found only 109 (25%) patients who had records in our adult offices out of the 440 Nemours patients in our data set. Of the 109 transitioned patients, 54 had office visits at CCHS, 37 at NAPA, and 18 at both locations. Examining the office visits of the 109 transitioned patients, 34 (31%) had an overlap in visits defined as an office visit at CCHS or NAPA before the last office visit at Nemours, and 75 (69%) did not have an overlap. The median gap between last pediatric and first adult office visit for the 75 patients without an overlap was 615 days (range 8–3495 d). Only 6 (6%) of the 109 transitioned patients had overlapping GFR measurements from pediatric to adult care, and all of the adult GFR calculations (CKD-Epi) were greater than the pediatric GFR calculations (Schwartz). The difference between child and adult GFR ranged from 8.2 to 87.1 mL/minute per 1.72 m^2. DISCUSSION/SIGNIFICANCE OF IMPACT: During the transition from pediatric care to adult care, many young adults with CKD experience declines in health outcomes and comorbidities such as diabetes and HTN complicate self-management. Lack of overlap between pediatric and adult care office visits indicates a delay in executing this transition. In our population of 109

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transitioned patients, 69% did not have an overlap in care, and 50% of those without overlap had a gap of more than 615 days (1 y, 8 mo). Our analysis suggests that young adults who are younger at last pediatric office visit are more likely to delay transitioning to adult care. Transitioning from the nurturing environment of pediatric care to adult care is a complex process and could be challenging for young adults with CKD. Transition clinics may be necessary to improve the coordination of care and help these young adults keep their physician appointments.

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Qualitative study of CVS risks perception, knowledge, and behavior among hypertensive African-Americans in South Bronx, NY

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OBJECTIVES/SPECIFIC AIMS: Compared to others, African-Americans (AA) have a higher prevalence of hypertension. Although, hypertension control has been well studied in clinical settings, a significant number of AA patients have uncontrolled hypertension. We conducted a qualitative study on CVD risk perceptions, knowledge, and behaviors among hypertensive AA in the South Bronx, NY. METHODS/STUDY POPULATION: Hypertensive AA participants, 18 years and older were recruited at a community-based hospital clinic. Focus groups with open-ended questions on CVD knowledge, perception, and behaviors was conducted. Responses were transcribed and transcript was analyzed using open code method. Concepts were formulated, which were then categorized into dominant themes. The sample size was based on the saturation point related to emerging common themes. RESULTS/ANTICIPATED RESULTS: There were 21 patients participated in 3 focus group sessions. The median age was 59 years; BMI median of 31.5 kg/m^2; 76% were female. In total, 57% had controlled BP and 67% were diagnosed with diabetes mellitus; 8 themes emerged of which unhealthy diet was dominant. Participants acknowledged eating fried foods and meat seasoned with salt contributed to their hypertension. Their food choices were based on family tradition and economical cost more than nutritional value. DISCUSSION/SIGNIFICANCE OF IMPACT: This study reveals that inner city hypertensive AA patients have misperceptions, gaps in knowledge, and barriers to healthy behaviors. We propose to partner with them using shared decision making to raise awareness, knowledge and change in behaviors to prevent CVD in community settings.

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A checklist for developing and implementing a high-impact monitoring and evaluation system in clinical and translational science programs

Boris Volkov

OBJECTIVES/SPECIFIC AIMS: This presentation will highlight the framework and domains of the monitoring and evaluation (M&E) System Checklist created in response to the need for practical guidelines and intended to improve the quality, efficiency, and consistency of monitoring and evaluation of the clinical and translational work. The recently published NCATS Strategic Plan (2016; p. 18) presents the following objectives and guidelines that implicitly suggest the need for sound M&E: "Objective 4-1: Continually assess and optimize internal business practices" and "Objective 4-2: Ensure all scientific programs and operational activities are conducted in a rigorous, robust and data-driven manner." Given the complexity of clinical and translational work and associated monitoring/evaluation processes and the dearth of practical tools in the CTR evaluation area, the need for such a checklist is clear. A "checklist" (a detailed list of items/steps required, things to be done, or points to be considered) is a type of informational job aid used to improve performance, reduce failure, deal with complexity, and ensure consistency and completeness in carrying out work. Checklists are popular in many fields—due to their brevity, concreteness, order, implicit (and sometimes explicit) mandate to do things right, and expectation for a checklist's being grounded in good practices and/or strong theory. A notable example is the famed WHO Surgical Safety Checklist (2008). The proposed M&E Checklist has been developed based on the author's extensive experience in internal evaluation, checklist development and use, and working with the Clinical and Translational Sciences Awards (CTSAs)—as the UMN CTSI M&E Director, ACTS Evaluation SIG Chair, and a Co-Lead of the Evaluators Working Group within the NCATS CTSA Common Metrics Initiative. Although there is no "golden" algorithm that will totally suit every organization, the M&E checklist provides useful guidelines for building M&E. The Checklist presents the key concepts and important issues in M&E development and implementation. It also incorporates a synthesis of 3 grounded frameworks: King and Volkov's Framework for Building Evaluation Capacity (2005), Simister's Framework for Developing M&E Systems for Complex Organizations (2009), and the award-winning CDC Framework for Program Evaluation in Public Health (1999). For the purposes of the proposed Checklist, an M&E system (or framework/approach) is understood as "a series of policies, practices and processes that enable the systematic and effective collection, analysis and use of monitoring and evaluation information" (Simister, 2009; p. 1). A well-designed M&E system ensures a consistent approach to the collection, analysis, and use of information, while allowing considerable scope for different parts of an organization to develop and apply their own solutions in response to their particular situations. The M&E Checklist structured around 3 key domains (adapted from the Volkov and King ECB Checklist, 2007): (1) M&E/organizational context: taking advantage of the internal and external organizational context, administrative culture, and decision-making processes. (2) M&E structures: creating structures—mechanisms within the organization—that enable the M&E development and use. (3) M&E resources: making M&E resources available and used. For each domain, the Checklist has a number of associated categories and activities. Specifically, the checklist adopts and adapts the following useful steps from Simister's approach: "Define the scope and purpose," "Perform a situational analysis," "Consult with relevant stakeholders," "Identify the key levels and focus areas," and "Integrate the M&E system horizontally and vertically," as well as the CDC Framework's steps "Engage stakeholders," "Focus the M&E Design," and "Ensure use and share lessons learned."With slight modification, the organizations can also utilize the Checklist as a rubric/assessment tool to gauge the status of their M&E capacity. METHODS/STUDY POPULATION: A case study of methodological/implementation tool development. There are no human subjects in this study, thus, Study Population is not applicable to this study. This study is not subject to IRB review. RESULTS/ANTICIPATED RESULTS: The proposed checklist approach shows sound promise to not only impact individual programs and their M&E systems but to also enhance internal evaluation capacity, critical thinking, learning, strategic management, and improvement within clinical and translational science organizations. DISCUSSION/SIGNIFICANCE OF IMPACT: The ultimate goal and impact of the proposed checklist is to help ensure that organizations and their M&E teams consistently follow a few critical steps and thereby maximize the quality, efficiency, and consistency of monitoring and evaluation of the clinical and translational work. The checklist's impact is significant in that it fills the current gap in the practice, literature, and methodology and provides practical guidance for CTR (and other) organizations and programs striving to improve the quantity and quality of evaluation.

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2402

Long-term stability of cortical language sites following resective epilepsy surgery

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BACKGROUND: Of the ~50 million cases of epilepsy worldwide, an estimated 80% originate from cortical areas implicated in language. Although the precise language loci can vary significantly across individuals, electrical stimulation mapping for eloquent areas has become standard of care in resective surgery for

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frontotemporal epilepsies. Although considerable work has been done to establish the minimum necessary resection distance from these sites to preserve language, no previous work has shown how these representations are affected by proximal resections. METHODS: Between 1967 and 2005, 22 patients [seizure onset (y): 11.5 (0.2–33); age at initial resection (y): 27.7 (10–39); time between operations (y): 8.4 (1–20.3); sex: 14 females; hemisphere: 21 left] underwent repeated perisylvian resective epilepsy surgeries of the language-dominant hemisphere. Each set of operations comprised intraoperative language mapping and cortical photographs. Using this data, a Bayesian hierarchical model was used to estimate the variability of language localization pre-resection Versus post-resection. RESULTS: The statistical model shows the posterior median difference in cortical location of language sites preresection Versus postresection is 0.6 cm, with a posterior 95% CI of 0.4 cm, 0.9 cm. CONCLUSION: This work suggests permanence in cortical language centers following resection of infringing cortex, while providing a reasonable statistical method to impute unobserved sites during the mappings, and confirming the validity of using proximity sites defined by shortest distance in the current literature.

2405

Coping strategies used by caregivers of newly diagnosed pediatric brain tumor patients

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OBJECTIVES/SPECIFIC AIMS: The goal of this study is to use patient-centered qualitative techniques to determine what strategies caregivers use to cope with the stress of a child having recently (ie, within the past month) undergone surgical removal of a brain tumor. Results will eventually be evaluated and compared with results of quantitative measures of psychosocial risk and distress as well as demographic and medical characteristics. METHODS/STUDY POPULATION: All caregivers of patients with a newly diagnosed brain tumor requiring neurosurgery admitted to Children's of Alabama (with English or Spanish-speaking parents) are eligible for enrollment. Participants are enrolled during their child's initial hospitalization for surgical removal of a brain tumor. Approximately 1 month after hospital discharge, during a routine follow-up clinic visit, caregivers participate in a semistructured interview with a research assistant. Interview questions are used to obtain information about parent and family coping by asking first broadly about stress management over the previous month and then specifically about individual coping strategies. Semistructured interviews are audio recorded, transcribed, and coded for common themes. Interviews are coded by using specific words or phrases to describe various domains of the experience from the caregiver's perspective. Each participant is given a study ID and study IDs are logged with each code word or phrase endorsed during the interview. RESULTS/ANTICIPATED RESULTS: To date, 22 caregivers have been enrolled and 15 have completed interviews. The most common coping mechanisms fall into the domains of active, avoidance, emotion-focused, and spiritual coping. Active coping consists of information seeking (eg, taking notes, internet research, asking questions), openly communicating emotions, celebrating small victories (eg, focusing on a good scan or test result, thinking that the diagnosis or treatment could have been worse), planning (eg, focusing on 1 d at a time), and maintaining normalcy (eg, maintaining extracurricular activities, returning to school if possible, continuing to see family and friends). Avoidance coping consists of evading discussions about emotions, withdrawal from family members, denial (eg, keeping a cancer diagnosis from the child), and avoiding seeing people or participating in activities. Emotion-focused coping consists of crying, laughing, and staying strong in front of the patient. In general, those who self-identify as coping poorly tend to be those who utilized more avoidance-focused coping strategies. Further, caregivers tended to identify active coping strategies (eg, taking notes, focusing on 1 appointment or treatment at a time) as the most helpful. DISCUSSION/SIGNIFICANCE OF IMPACT: It will be helpful for providers to more deeply understand the experience of caregivers whose children have recently undergone brain tumor resection and the strategies used to cope with the stress of the first month postsurgery. This information can be used to create standardized interventions for use during posthospitalization clinic visits. For example, if families continue to endorse that active coping mechanisms are the most helpful, providers can assist caregivers in developing these strategies (eg, uniformly provide notebooks and encourage caregivers to keep track of questions and appointment information, pair caregivers who are struggling with others who use more active coping strategies). Those utilizing more avoidance coping strategies may need more coaching and recommendations. A brief assessment could potentially be developed for caregivers dealing with this diagnosis, in order to quickly assess coping strategies and provide appropriate recommendations. Future analyses will determine whether initial coping strategies and adjustment are predicted by child age or medical information.

2414

Reperfusion strategies when non-stemi is misclassified as stemi myocardial infarction

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OBJECTIVES/SPECIFIC AIMS: A retrospective analysis was done at the Cardiovascular Center to evaluate reperfusion strategies, including stemi infarcts and non-stemi classified as stemi in a period of 2 years. METHODS/STUDY POPULATION: Review the records of stemi infarcts in a period of 2 years. RESULTS/ANTICIPATED RESULTS: In total, 101 cases were classified as stemi, but after strict analysis (time wise) 24 cases were non-stemi; 47% had inferior myocardial infarction and 38% an anterior myocardial infarction with a mean age of 65 years. All cases were immediately catheterized. Although the non-stemi, classified originally as stemi did not meet the time limit (<2 h) for cath. The stemi group (77 P.) 58 P. had angioplasty with stent implantation. 19 P. had an EF of 45% and remained that way during follow up. The rest of the P. the EF went up to 50% or more. The non-stemi group (24 P.) had angioplasty with stent implantation. The EF remained around 40% during follow up, which was the EF on admission. Fibrinolysis was given erratically. No changes were seen in the EF on follow up in the fibrinolytic group. DISCUSSION/SIGNIFICANCE OF IMPACT: This shows the importance of classifying the P. well between stemi and non-stemi. The time frame to catheterization should be kept as strict as possible, due to transmural infarcts, and catheterized in <2 hours to avoid deterioration of the left ventricular function and its consequences. This strict classification will save money to the institution when emergency catheterization is avoided in the non-stemi group.

2421

Patient and household member colonization and environmental contamination with *Staphylococcus aureus* in a comparative effectiveness study of home-based interventions to reduce CA-MRSA recurrence and household transmission

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OBJECTIVES/SPECIFIC AIMS: Community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) skin and soft tissue infections (SSTIs) are commonly seen in primary care, with recurrence rates that range from 16% to 43%, and present significant challenges to clinicians, patients, and families. This comparative effectiveness research study aims to develop and evaluate a home-based intervention implemented by Community Health Workers (CHWs) or "promotoras" to prevent recurrence of CA-MRSA in patients presenting to primary care with SSTIs and transmission within their households. This presentation will examine associations between wound microbiology, clinical presentation, and housing characteristics, including housing density and household surfaces contamination. METHODS/STUDY POPULATION: In partnership with 3 Community Health Centers and 3 community hospitals in NYC, this study will recruit patients (n = 278) with confirmed MRSA SSTIs and their household members. Participants will be randomized to receive either a CHW/Promotora-delivered decolonization-decontamination intervention (based on the REDUCE MRSA trial) or usual care. The highly engaged stakeholder team finalized the intervention protocol, developed and implemented CHW and clinician training, and developed an online health portal application for data management and exchange. RESULTS/ANTICIPATED RESULTS: We have collected 923 isolates from 237 individuals, including 240 wound culture isolates and 683 surveillance culture isolates (nares, axilla, groin). MRSA and MSSA were found in 19% and 21.1% of wound cultures, respectively; 59.5% with MRSA + wound culture had 1 or more MRSA + surveillance culture; 67.8% with MSSA + wound culture had 1 or more MSSA + surveillance culture. Of those with MRSA or MSSA infections, 70% of subjects were male, with an average age of 37.9 (SD = 15.9 y). The most frequent sites of infection were the leg (20%), axilla (18%), buttock (17%), and abdomen/torso (12%). There was no association between the location and type of infection (MRSA/MSSA) (p-value = 0.09). The kitchen floor (14.05%) and bedroom floor (14%) were the most common surfaces contaminated with MRSA. These were also the most common surfaces contaminated with MSSA, which was recovered from 10.2% and 9.1% of kitchen floors and bedroom floors, respectively. For individuals with an MRSA or MSSA wound infection, there was an average number of 3.2 (SD = 1.6) co-residents per household, and 36.5% of household members were colonized with either MRSA or MSSA. There is no association between household density (number of co-residents)

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and type of infection (MRSA/MSSA) (Fisher's p-values = 0.171 and 0.371, respectively). In households of participants with MSSA wound infections, the number of colonized sites is positively associated with the level of household MSSA contamination ($p = 0.027$). Further analyses will examine the associations between molecular subtypes, wound location, household surface contamination and household member colonization and infection. DISCUSSION/SIGNIFICANCE OF IMPACT: This study aims to understand the patient-level and environmental-level factors associated with SSTI recurrence, surface contamination and household transmission, and to examine the interactions between bacterial genotypic and clinical/phenotypic factors on decontamination, decolonization, SSTI recurrence and household transmission. This study will evaluate the barriers and facilitators to implementation of home visits by CHWs in underserved populations, and aims to strengthen the evidence base for implementation of strategies to identify and reduce household reservoirs and then control SSTI recurrence and household transmission.

2423

Social determinants of health and comorbidity in individuals with type 2 diabetes at HealthStreet, a community engagement initiative

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OBJECTIVES/SPECIFIC AIMS: Research on social determinants of health (SDHs) in type 2 diabetes have largely examined disease etiology rather than severity. To find factors associated with complications, we investigated socio-demographics, healthcare access, and healthcare utilization in individuals with type 2 diabetes with respect to related comorbidity. METHODS/STUDY POPULATION: Community health workers assessed 8494 participants for type 2 diabetes (n = 939; 11%) through HealthStreet, a community-engagement model implemented in North Central Florida. Comorbidities were defined as neuropathy, retinopathy, high cholesterol, hypertension, and kidney failure. We conducted multivariate analyses to test the association of socio-demographic factors and comorbidity status. RESULTS/ANTICIPATED RESULTS: Of 939 members with type 2 diabetes, 164 (17%), 272 (29%), 370 (39%), and 133 (14%) reported having 0, 1, 2, and 3+ comorbidities, respectively. There is a smaller proportion of African-Americans reporting 3+ comorbidities compared with other comorbidity groups ($p = 0.003$). Those with more comorbidity are less employed ($p < 0.0001$) and are more likely to have Medicare/Medicaid ($p = 0.03$) than those without comorbidity. Those with no comorbidity are more likely to be uninsured compared to those with comorbidity ($p = 0.0297$). Adjusting for age, race, gender, and BMI, those that have at least 1 comorbidity are 1.4 times more likely to be food insecure ($p = 0.004$) and are 1.9 times more likely to have seen a doctor in the past 12 months ($p = 0.002$) compared to those without comorbidity. DISCUSSION/SIGNIFICANCE OF IMPACT: Although there is complexity among the relationships between SDHs and diabetic comorbidity, results suggest significant sociodemographic and healthcare-related disparities among individuals living with type 2 diabetes. Members with more comorbidity utilize healthcare, but are more likely to be food insecure among other factors. Those with no comorbidity are least likely to see a physician, which could imply a gap in the care continuum. This analysis gives insight into the importance of efficient diabetes management, focused on disparities in economic stability and healthcare access and utilization.

2424

National trends in ambulatory Versus emergency department visits for low-income patients with skin and soft tissue infections

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OBJECTIVES/SPECIFIC AIMS: Community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) skin and soft tissue infections (SSTIs) recurrence ranges from 16% to 43% and presents significant challenges to clinicians, patients, and families. The number of emergency department visits for SSTIs increased from 1993 to 2005 from 0.48 to 1.16 ED visits per 100 US residents (95% CI 0.94 to 1.39; $p < 0.001$); high safety-net status EDs saw a 4-fold increase in visits. The CA-MRSA Project (CAMP2) comparative effectiveness research (CER) study aims to evaluate a home-based intervention implemented by Community Health Workers (CHWs) or "promotoras" to prevent recurrence and transmission of CA-MRSA in primarily low-income, minority patients presenting to primary care with SSTIs. The intervention disseminates and implements methods found effective in the REDUCE MRSA trial. The present analysis was conducted using publically available data set to characterize the national patterns of healthcare utilization for treatment of SSTIs. METHODS/STUDY POPULATION: An analysis was conducted using data downloaded from the CDC National Ambulatory Medical Care Survey (NAMCS) and the CDC National Hospital Ambulatory Medical Care Survey (NHAMCS) from 2012 (most recent data available) to evaluate the addition of Emergency Departments (EDs) as compared to Ambulatory Care as recruitment sources for a clinical trial to reduce CA-MRSA SSTI recurrence and household transmission. "Low-income" population was defined using "Expected Source of Payment" categories "Medicaid" and "Uninsured," and ICD-9-CM dermatologic diagnosis codes for SSTIs and ICD-9-CM Procedure Codes for Incision and Drainage (I&D) were used to define a visit for SSTI treatment. RESULTS/ANTICIPATED RESULTS: In all patients, I&D was performed at a higher rate in EDs as compared with the ambulatory care setting (49.57 vs. 1.44 per 10,000 US residents in Medicaid and Uninsured; 44.48 vs. 5.24 per 10,000 US residents in all other insurance types). Nationally, low-income patients are 4 times more likely to have I&D procedure performed (OR 4.05, 95% CI 0.614–26.759, $p < 0.0001$) and 5 times more likely to be diagnosed with an SSTI (OR 5.10, 95% CI 2.987–8.707, $p < 0.001$) in the ED setting. DISCUSSION/SIGNIFICANCE OF IMPACT: These results confirm that low income patients seek primary care for SSTIs in both EDs and ambulatory care, such as Federally Qualified Health Centers (FQHCs). This also confirms the trend we have experienced in FQHCs in NYC, many of whom refer patients to the ED for the I&D procedure, and those patients return to the FQHC for follow-up. Thus, the most comprehensive test of using CHWs to disseminate and implement the findings from the REDUCE MRSA trial would engage both EDs and Ambulatory Care/FQHCs for patient identification and recruitment.

2443

Investigating markers of early traumatic brain injury (iMet): An interim analysis

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OBJECTIVES/SPECIFIC AIMS: Analyze data from the first 30 children enrolled in a prospective cohort study evaluating the ability of specific serum biomarkers to distinguish children with traumatic brain injuries (TBI) from children with orthopedic injuries (OI). METHODS/STUDY POPULATION: Children ages 0 < 5 years were eligible if they presented to the emergency department within 6 hours of injury. Children were identified as having a TBI if they sustained a head injury and were found to have an acute injury on head CT. Children were identified as having an OI if they sustained a musculoskeletal injury significant enough to necessitate radiography per clinical care. Individual (eg, age) and clinical (eg, radiography findings) factors, as well as serum biomarkers [eg, ubiquitin C-terminal hydrolase L1 (UCH-L1), glial fibrillary acidic protein (GFAP)] were collected at time of enrollment. TBI and OI groups were compared using Wilcoxon rank-sum and Kruskal-Wallis tests. RESULTS/ANTICIPATED RESULTS: This cohort consisted of 13 children with TBI (7 with isolated skull fractures, 1 with intracranial injury, and 5 with both a skull fracture and an intracranial injury) and 17 with OI (12 with fractures). Most patients were male (67%) and White (67%), and this did not differ between groups ($p > 0.1$). Children with TBI were significantly younger than children with OI, with an average ($\pm$ standard deviation) age of 15 ± 13 and 39 ± 13 months, respectively ($p < 0.01$). There was not a significant difference in time from injury to biomarker collection between TBI and OI patients at 4.1 ± 1.8 and 5.8 ± 2.6 hours, respectively ($p = 0.07$). Median (IQR) levels of GFAP were significantly higher ($p < 0.01$) in children with TBI, relative to children with OI: 220 (67–421) pg/mL Versus 37 (25–74) pg/mL, respectively. Median (IQR) levels of UCH-L1 were also significantly higher ($p < 0.01$) in the TBI group, relative to children with OI: 444 (377–449) pg/mL Versus 248 (140–417) pg/mL, respectively. In a subanalysis comparing median biomarker levels across three study groups (ie, TBI with an isolated skull fracture, TBI with an intracranial injury, and OI), group differences remained significant for both biomarkers with TBI patients having higher levels, relative to OI patients, of both GFAP ($p < 0.01$) and UCH-L1 ($p = 0.02$). DISCUSSION/SIGNIFICANCE OF IMPACT: GFAP and UCH-L1 hold promise to improve the diagnosis of TBI in very young children. Identification of a marker of TBI that can be done in the acute care setting would advance the diagnosis of TBI in very young children, a vulnerable population for whom identification of neurological symptoms can be challenging.

2447

Risk of adjacent segment breakdown at the cervico-thoracic junction: Where should we stop?

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OBJECTIVES/SPECIFIC AIMS: Cervical fusion is commonly performed for the management of degenerative disc disease, which can cause spinal stenosis and radiculopathy. Adjacent segment disease (ASD) is an adverse postsurgical outcome experienced by some patients as new radiculopathy, stenosis, or other

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symptomatic sequelae. We sought to assess whether fusion extension past the cervicothoracic junction reduces the risk of distal ASD after multilevel fusions ending at C7-T3. METHODS/STUDY POPULATION: We retrospectively reviewed all first-time patients undergoing instrumented cervical fusion of at least 2 spinal levels and whose distal level of fusion ranged from C7-T3, at the Johns Hopkins Medical Institutions, from 1999 to 2013. The primary outcome was reoperation for distal ASD. Using multiple logistic regression, ANOVA, and χ^2 analysis, we determined the odds of ASD due to age, gender, distal level of fusion, surgical approach (anterior, posterior, or combined), smoking status, and race. RESULTS/ANTICIPATED RESULTS: Of the 158 patients who met the selection criteria, the mean age was 58.7 ± 13.8 years, and 95 (60.1%) were female. Ten patients (6.3%) underwent reoperation for ASD. Patients whose fusions ended at C7 were significantly more likely to develop ASD and undergo reoperation (70%, $p = 0.007$) than those whose fusions ended at T1. There were no differences in age, proximal fusion level, smoking status, BMI, gender, and patient-reported race between the reoperation and non-reoperation groups. Following a multivariable analysis, extending the distal fusion to T1 was again found to be protective against reoperation (OR = 0.07, $p = 0.020$). DISCUSSION/SIGNIFICANCE OF IMPACT: Our study shows that for multilevel instrumented cervical fusions that terminate within the cervicothoracic junction, fusion distal to the C7 vertebra is associated with decreased odds of reoperation for symptomatic ASD. Therefore, this study provides clinical evidence that may help surgeons determine the optimal distal fusion segment for multilevel fusions ending at C7-T3.

2450

Factors associated with urban youth and parent perceptions of the preventability of their emergency department visit for an assault-related injury

Antony Gatebe Kironji, Tina Cheng, Vanya Jones, Sarah Lindstrom Johnson, Joel Fein and Leticia Ryan

OBJECTIVES/SPECIFIC AIMS: To identify factors associated with urban youth and parent perceptions of the preventability (PoP) of the youth's medically attended assault injuries in order to guide future violence prevention strategies. METHODS/STUDY POPULATION: Assault-injured youth (n = 180; ages 10–15; 60% male; 96% African-American) and their parents were recruited from 2 pediatric emergency departments (EDs) in Baltimore and Philadelphia between June 2014 and June 2016. Data on demographics, circumstances of injury, injury severity, and perceptions of the injury were collected from chart review and in-person interviews with youth and parents using previously validated instruments. Within youth and parent groups, we compared those who reported "definitely true" when asked if the event that brought them to the ED could have been prevented to those who reported "maybe true" or "unlikely" using χ^2 testing. RESULTS/ANTICIPATED RESULTS: In total, 68 (37.8%) youth and 123 parents (68.3%) reported that the injury was definitely preventable. Youth who were injured indoors [OR 2.13 (95% CI 1.17, 3.88), $p = 0.013$] or considered their injury not serious [OR 4.82 (95% CI 1.78, 13.11), $p = 0.002$] were more likely to perceive injury preventability and those who reported being the victim were less likely to perceive injury preventability [OR 0.26 (95% CI 0.01, 0.67), $p = 0.005$]. Bullying and use of weapons were not associated with youth PoP. Parents were significantly more likely to perceive preventability when the person/people involved were known by the youth [OR 1.94 (95% CI 1.04, 3.62), $p = 0.037$] and when the injury occurred indoors [OR 1.96 (95% CI 1.04, 3.69), $p = 0.038$]. Similar to youth, parental report of bullying was not associated with parent PoP. Injury severity, and victim role of their child were also not associated with parent PoP. DISCUSSION/SIGNIFICANCE OF IMPACT: A prior violent injury is a major risk factor for future injuries and homicides. Through our work we were able to identify factors associated with youth and parent perception of preventability of injuries in a high risk population. Youth who felt victimized were less likely to perceive their injury as preventable. In addition, parents were more likely to perceive the injury as preventable when their injured child knew those involved in the incident. This work can inform violence prevention strategies and potentially identify opportunities to reduce intentional injuries in urban youth.

2452

Artificial urinary sphincter failure: Characterizing the causes of failure and individual device component survival

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OBJECTIVES/SPECIFIC AIMS: Stress urinary incontinence (SUI) significantly affects quality of life and occurs in 60% of men after radical prostatectomy, with 5% requiring surgical treatment. The artificial urinary sphincter (AUS) offers these patients excellent control of their post-prostatectomy SUI. The device contains 3 parts: the pump, urethral cuff, and pressure regulating balloon. Despite the effectiveness of AUS, up to 50% of patients require surgical revision after initial placement due to recurring SUI. Thus far, literature is heterogeneous regarding the causes of mechanical AUS failure and appropriate surgical management. Our study aims to characterize the most common reasons of AUS failure requiring surgical revision and the survival of each AUS component. METHODS/STUDY POPULATION: We report a series of 48 patients who received AUS placement and/or revision by 1 surgeon from 2010 to 2013. Upon presenting for revision, intraoperatively, the surgeon systematically evaluated the device for failure of the balloon, cuff and pump as well as urethral erosion and atrophy. In patients not requiring revision all device components were presumed functional. We conducted retrospective chart review to collect baseline characteristics, intraoperative findings, and postoperative outcomes. Using Kaplan-Meier estimates, we calculated incidence rates of component failure for the cuff, pump, and balloon. To identify risk factors for AUS failure, Cox regression was performed for univariate and multivariable testing. Multivariable modeling included those variables considered biologically plausible and significant in univariate testing. RESULTS/ANTICIPATED RESULTS: In total, 48 patients were studied with median follow up of 4.25 years. All patients received an AMS 800 device with a 61–70 mL balloon filled with 27 cc of isotonic contrast. Cuff sizes ranged from 3.5 to 5.5 cm, with 4.5 cm selected in 33/48 cases (68.8%); 19 of the patients required AUS correction (41.7%). Balloon leak constituted 57.9% (11/19) of failures, followed by cuff failure/urethral atrophy (21.1%), urethral erosion (10.5%), and individual cases of infection and pump failure. Median time to mechanical failure due to balloon leak was 3.67 years (IQR 2.17, 5.33); median time to failure for nonballoon causes was 0.54 years (IQR 0.25, 1.83). Survival of the balloon, cuff, and pump was 100%, 95.7%, and 97.9% at 1 year and 76.9%, 91.0%, and 97.9% at 5 years, respectively. DISCUSSION/SIGNIFICANCE OF IMPACT: Our study identifies fluid leakage from the balloon as the most common cause of AUS failure, particularly in patients presenting between 1 and 5 years after initial placement. For such patients, interrogating the balloon first can decrease infection risk and surgical morbidity as it can avoid manipulation of the urethral cuff. Furthermore, simply replacing lost fluid saves cost and allows for immediate reactivation of the AUS device.

2460

Change in duration of postoperative antibiotic prophylaxis in esophagectomy patients: Outcomes in a single academic institution

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OBJECTIVES/SPECIFIC AIMS: Ivor-Lewis esophagectomy (ILE) is an invasive surgical procedure with a high incidence of postoperative pneumonia. Antibiotic prophylaxis could reduce respiratory infections but increase *Clostridium difficile* and antibiotic resistance. Our institution reduced the duration of piperacillin-tazobactam prophylaxis following ILE from 4 to 1 day or less in January 2015. We evaluated short-term outcomes in ILE patients before and after this institutional change. METHODS/STUDY POPULATION: Retrospective cohort study of all ILE patients from 2012 to 2016. We confirmed antibiotic duration directly from nursing medication administration records. The primary outcomes of this study were rates of *C. difficile* and postoperative pneumonia. Secondary outcomes include other infection, length of hospital stay, and readmission within 30 days. We used logistic regression to analyze impact of days of antibiotics and χ^2 or Fischer exact tests for categorical variables. RESULTS/ANTICIPATED RESULTS: Of 104 ILE patients, 40.4% (n = 42) were after January 2015, 11.5% developed pneumonia and 5.8% developed *C. difficile* colitis. ILE patients received more days of antibiotics before the institutional change compared with after (6.1 vs. 2.9 d, $p < 0.01$). For a 1-day increase in antibiotic duration, the odds of acquiring *C. difficile* increased significantly by 1.2 ($p = 0.03$). Before compared with after the institutional change, rates of *C. difficile* were 8.1% Versus 2.4% ($p > 0.2$), rates of pneumonia were 11.3% Versus 11.9% ($p > 0.2$), and length of stay was 10.9 Versus 10.5 days ($p > 0.2$), respectively. DISCUSSION/SIGNIFICANCE OF IMPACT: Institutional policy can have an impact on patient outcomes. Antibiotic stewardship is associated with reduced rates of inpatient *C. difficile*. Our study suggests reduced antibiotics are not associated with pneumonia, although larger studies are necessary to confirm this finding. Surgeons should consider the benefit of decreased rates of *C. difficile* before administering prolonged antibiotic prophylaxis following esophagectomies.

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Communication frequency and content between parents of concussed youth and systems of care

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OBJECTIVES/SPECIFIC AIMS: To characterize parent communication frequency and content between systems of care (medical, school, and sports/recreation) of concussed youth who are in prolonged recovery. METHODS/STUDY POPULATION: In this ongoing study, 16 concussed youth (average age = 14.9 years, SD = 1.5; 31.2% female and 68.8% male) and their parent study partner (average age = 44.3 years, SD = 4.3; 87.3% female and 12.5% male) have been enrolled to date from sports medicine clinics. Demographic information was obtained during the initial clinic intake session. Weekly phone calls were also conducted with the parent and child until the child was considered asymptomatic (ie, reporting no symptoms on the SCAT3), to collect data on communication with the school, sport/recreation, and medical systems throughout the recovery process. For the purpose of this study, we evaluated communication patterns of those parents who had a child in prolonged recovery (ie, symptomatic 14 d or more post-concussion injury). Communication variables included frequency (ie, number of times a parent contacted or attempted to contact a system of care) and content or topic discussed during the contact event. RESULTS/ANTICIPATED RESULTS: Of the 16 enrolled participants to date, 68.8% (n = 11) experienced concussion related symptoms 14 days postinjury (M = 22.2, SD = 4.6) at the time of their 2 week follow-up call and were thus considered to be in prolonged recovery. Of those 11, 81.8% (n = 9) of parents reported communicating with the school system at some point between the initial clinic intake session and the 2 week follow-up phone call. The frequency of communication for this period ranged between 0 and 10 instances of contact (M = 2.5, SD = 2.9). Of the 11 prolonged cases, 8 participants were members of sports teams. Sixty-three percent (n = 5) of those parents with a child on a sports team communicated with a coach while none of the parents contacted a team athletic trainer. The frequency of communication with the coach ranged from 0 to 8 (M = 1.5, SD = 2.5) over the course of 2 weeks from enrollment. With regards to the medical system, the majority of parents (72.7%, n = 8) communicated at least once with a medical professional during the same time period. The frequency of communication with the medical system ranged from 0 to 8 (M = 2.2, SD = 2.6) points of contact. Themes that arose for communicating with the school system included informing school personnel of academic accommodations prescribed by the physician, explaining absences, and concerns about missed academic work and grades. The content of communication with the sports system (ie, coach) pertained to return-to-play issues as well as progress updates on recovery. Themes for communication with the medical system were centered on scheduling appointments, attending follow-up medical appointments, and starting return-to-play protocols. DISCUSSION/SIGNIFICANCE OF IMPACT: Parents of concussed youth who were still in prolonged recovery, for the most part, appear engaged in communicating with multiple systems of care. However, a subset of parents did not participate in contact with these systems. Further discussion of these findings will highlight areas for improvement in concussion management as well as strategies parents can utilize to advocate for their child in terms of return-to-learn and recovery.

2479

Validating acute urinary retention using diagnosis and procedure codes

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OBJECTIVES/SPECIFIC AIMS: We evaluated the accuracy of diagnosis and procedure codes to identify acute urinary retention (AUR) due to lack of existing validation studies. METHODS/STUDY POPULATION: We performed a cross-sectional validation study at a single medical institution in the emergency department (ED) and outpatient Urology Clinic in men ≥45 years. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes 788.20, 788.21, 788.29 for urinary retention and Current Procedural Terminology, Fourth Edition (CPT-4) codes 51701, 51702, 51703 for urinary catheterization were used to identify men with potential AUR. Four algorithms using ICD-9-CM and CPT-4 codes were compared against medical record review. Sensitivity, specificity, positive predictive value, negative predictive value, and area under the curve were calculated for both the ED and Urology Clinic. RESULTS/ANTICIPATED RESULTS: A total of 333 treated and released men in the ED were identified using facility billing data, and 245 men using physician billing data in the Urology Clinic were identified using the codes for urinary retention or urinary catheterization. Of the 4 algorithms, any ICD-9-CM diagnosis code for urinary retention was the preferred algorithm with a sensitivity and specificity of 0.95 and 0.91 using ED facility billing data and a sensitivity and specificity of 0.95 and 0.58 using Urology physician billing data. DISCUSSION/SIGNIFICANCE OF IMPACT: Use of the ICD-9-CM diagnosis codes for urinary retention performed well at identifying AUR in the ED. This study provides justification to use urinary retention diagnosis codes (specifically 788.20 and 788.29) in future studies to identify AUR using administrative data, especially in the ED.

2483

Evaluating a community research consult service: Getting to outcomes and impacts

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OBJECTIVES/SPECIFIC AIMS: This study describes the design, operation, and evaluation of a community-based research (CBR) consult service within the setting of a Clinical and Translational Science Award (CTSA) institution. To our knowledge, there are no published evaluations of a CBR consult service at a CTSA hub. METHODS/STUDY POPULATION: A CBR consult service was created to support faculty, healthcare providers/research coordinators, trainees, community-based organizations, and community members. A framework was developed to assess the stages of client engagement and to foster clear articulation of client needs and challenges. A developmental evaluation system was integrated with the framework to track progress, store documents, continuously improve the consult service, and assess research outcomes. RESULTS/ANTICIPATED RESULTS: This framework provides information on client numbers, types, services used, and successful outreach methods. Tracking progress reveals reasons that prevent clients from completing projects and facilitates learning outcomes relevant to clients and funding agencies. Clients benefit from the expert knowledge, community connections, and project guidance provided by the consult service team, increasing the likelihood of study completion and achieving research outcomes. DISCUSSION/SIGNIFICANCE OF IMPACT: Our evaluation suggests that clients benefit by (1) gaining the collective knowledge of the experts comprising the team, (2) learning the process of doing CBR, including the required steps to reach completion, and (3) gaining a project management mentality promoting translational research outcomes. This study offers a framework by which CTSA institutions can expand their capacity to conduct and evaluate CBR while addressing challenges that inhibit community engagement.

2484

Establishment of the Tennessee-sickle cell disease network as a mechanism for engaging a rare disease population in patient centered outcomes research

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OBJECTIVES/SPECIFIC AIMS: Despite the high prevalence of individuals diagnosed with sickle cell disease (SCD) in Tennessee, comprehensive care and education for patients with SCD is not as widely available as healthcare services for individuals managing other chronic illnesses. We aimed to engage SCD stakeholders in patient-centered outcomes research (PCOR) as a mechanism for advancing care and translational research for this rare disease population. METHODS/STUDY POPULATION: Through a partnership with the Sickle Cell Foundation of Tennessee, we implemented Community Health Ambassadors to systematically engage patient partners with SCD and their caregivers, aged 18–50 from rural and urban communities throughout Tennessee, in PCOR to establish a sustainable infrastructure, focused on connecting the SCD community through a service providing community-based organization to offer (1) information on how to connect with other families; and be informed about SCD community activities, or educational offerings; (2) training in basic research principals; and (3) opportunities to contribute to PCOR, including feedback on effective and practical ways for providing input on research efforts through patient centered input, comparing urban and rural area preferences. Community ambassadors utilized health fairs, clinic days at various hospitals and community centers, and social media to spread awareness of the project, in addition to boosting the recruitment process. RESULTS/ANTICIPATED RESULTS: A statewide SCD network was developed to offer social support and increase access to education, medical care, and engagement in research activities. Findings include: recruitment of 150 patients and 35 executive committee members (local physicians, community leaders, adults

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with SCD and parents of children with SCD). DISCUSSION/SIGNIFICANCE OF IMPACT: Most rural and urban families affected by SCD have no systematic way to engage in, or lend their expertise to, PCOR. A statewide network of patient partners, community stakeholders, researchers, and medical professionals will ultimately increase the standard of care for patients, and provide valuable insight for SCD research. The opportunity to create the underpinnings for coordinated patient-centered education for patients with SCD and their caregivers holds promise for developing a scalable PCOR process model for replication and implementation in other states and emulate this model with other rare disease populations.

2496

Improving minority health and reducing health disparities: Research at the intersection of health disparity science and clinical and translational science

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OBJECTIVES/SPECIFIC AIMS: (1) To explain and discuss minority health and health disparities and the mechanisms, for example, individual behaviors and lifestyle, genetics and epigenetics, physical and cultural environment, and clinical events and health care, that lead to health disparities. (2) To explore the intersection between health disparity science and clinical and translational science. (3) To present and discuss the NIMHD Framework and how it can be used to guide multilevel research to address minority health and health disparities. (4) To highlight examples of NIMHD-funded novel and innovative research relevant to clinical and translational research from a health disparities perspective. METHODS/STUDY POPULATION: The NIMHD Research Framework will be introduced that is currently being used by NIMHD to address minority health and health disparity research. The Framework looks at targeted populations in relation to biological, behavioral, physical, and sociocultural environmental domains of influence as well as the health care system. These domains have different levels of influence: individual, family/interpersonal, community, and population. Targeted populations include NIH-designated health disparity populations, that include racial/ethnic minorities, socioeconomically disadvantaged populations, underserved rural populations, and sexual and gender minorities. The following research opportunities are among the many opportunities offered by NIMHD: Disparities in Surgical Care and Outcomes Social Epigenomics for Minority Health and Health Disparities Addressing Health Disparities Among Immigrant Populations. RESULTS/ANTICIPATED RESULTS: Select examples of NIMHD supported minority health and health disparities research that intersects with clinical and translational research will be presented. Candidate examples include: Genetic Architecture of Lupus (SLE) in individuals with Asian ancestry; A Novel Racial Disparity Marker for Risk Prediction in Triple Negative Breast Cancer Patients; Self-Applied Wearable Ultrasound Therapy for Osteoarthritis Management in Rural Central NY; Design and Development of a Multifunctional Self-service Health Screening Kiosk. DISCUSSION/SIGNIFICANCE OF IMPACT: Despite notable improvements gained as a result of medical and scientific advances, there continues to be an alarming disproportionate burden of illness and lack of representation in research among minority and other socially disadvantaged and underserved populations. To meet this challenge, NIMHD is committed to supporting a wide range of clinical and translational research aimed at the development of innovative strategies and approaches to reduce and, eventually, eliminate health disparities. NIMHD's mission, research priorities, and funding opportunities are relevant to the efforts and interests of clinical and translational scientists, especially those interested in the translation of research findings into interventions, products, and tools that may improve minority health and quality of life, increase adherence to medication and treatment regimens, increase access, and improve the delivery of health services.

2497

Risk factors for poor retention in HIV care using clinic and statewide surveillance data

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OBJECTIVES/SPECIFIC AIMS: Approximately 50% of people who have been diagnosed with HIV are either not linked to a care provider or not retained in medical care. This has substantial implications for both individual and public health outcomes. On an individual level, being retained in care is necessary for continuous receipt of antiretroviral therapy and sustained viral suppression. The public health implications of poor retention in HIV care are also serious, as it is estimated that people with HIV who are not retained in medical care are responsible for a majority of HIV transmissions, even more than the number of transmissions attributable to those who are HIV infected but undiagnosed. State departments of health routinely collect surveillance data including positive HIV test results, CD4 counts and viral load measures for monitoring trends in HIV infection. A shift in the use of these surveillance measures, guided by the CDC, has brought forth the opportunity to use these data for direct patient services and, more specifically, to direct re-engagement and retention in care efforts. Although the risk factors for poor retention in HIV care have been characterized using information from individual or multiple clinics, this study seeks to incorporate state surveillance data into the retention measures. METHODS/STUDY POPULATION: This retrospective cohort study was performed at the University of Alabama at Birmingham 1917 HIV/AIDS Clinic among patients with at least one attended HIV primary care visit during the calendar year of 2015. Retention during the calendar year of 2016 was then measured as whether or not a patient had 2 or more completed clinic visits which were separated by more than 90 days (in accordance with the Health Resources and Services Administration or HRSA guidelines, a National HIV Quality Indicator). For patients who did not have any primary care visit in 2016, the Alabama Department of Public Health will provide a status of care (out of care, in care elsewhere, died, moved out of state, and cannot locate) based on HIV laboratory results reported from all clinics and labs across the state and/or mortality information. A multinominal regression model of the status of care will be fitted to demographic, clinical, laboratory, and behavioral patient reported outcomes captured during an index visit in 2015. RESULTS/ANTICIPATED RESULTS: Data were recently obtained and is currently being analyzed on 3107 patients included in this study. We anticipate that there will be differences in the factors significantly associated with patients classified as out of care, poorly retained (patients who have only one completed clinic visit), and retained in care by the HRSA measure during calendar year 2016. DISCUSSION/SIGNIFICANCE OF IMPACT: By incorporating state surveillance data into our analysis, we expect to obtain a more precise picture of the risk factors for poor retention among HIV patients. For the first time, we will be able to determine if patients lost to our HIV clinic (~10% annually) are entirely lost to medical care or are seeking care elsewhere as indicated by HIV lab data reported to public health via surveillance. Identified risk factors will then be able to better inform the efforts to proactively improve the efficiency for HIV patient retention and re-engagement, and therefore lead to better individual outcomes for HIV patients and reduce the incidence of new HIV cases.

2501

Depression and mental health service use: Data from National Health and Nutrition Examination Survey (NHANES) 2006–2012

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OBJECTIVES/SPECIFIC AIMS: Examine mental health service use and its correlates among depressed group in a national sample of population ≥ 20 years old. METHODS/STUDY POPULATION: Analysis of data for adult ≥ 20 years old from the NHANES 2006–2012. Depression was assessed using the 9-item PHQ. The use of mental health and antidepressant drug were used to indicate the service use. We utilized multiple logistic regressions to determine the independent association between service use and each independent variable (demographics, health status, food security, chronic conditions, and depression severity) controlling for other independent variables. Data were presented as adjusted odds ratio (AOR), 95% confidence interval (95% CI), and p-value of statistical significance. p-value of < 0.05 indicates statistical significance. RESULTS/ANTICIPATED RESULTS: Of the 17,824 subjects, 22% had mild to severe depression. Among the depressed group, 25% used antidepressant, 17% used mental health service. For the use of mental health services among the depressed group, African-American (AA), ≥60 years old, uninsured and foreign born were less likely to use the mental health service relative to other groups [AOR = 0.58 (95% CI = 0.45–0.75), 0.21 (95% CI = 0.14–0.33), 0.61 (95% CI = 0.45–0.83), 0.41 (95% CI = 0.17–0.99), respectively, $p < 0.05$]. For the use of antidepressant drug among the depressed group, AA, Hispanics, uninsured and foreign born were less likely to use antidepressant drug relative to other groups [OR = 0.26 (95% CI = 0.20–0.33), 0.42 (95% CI = 0.31–0.57), 0.41 (95% CI = 0.31–0.56), 0.20 (95% CI = 0.10–0.78), respectively, $p < 0.05$). For the use of mental health services and/or antidepressant drug among the depressed group, 40–59 years old, AA, Hispanics, uninsured, foreign born were less likely to use mental health services and/or antidepressant drug relative to other groups [OR = 0.52 (95% CI = 0.38–0.72), 0.35 (95% CI = 0.28–0.43),

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0.52 (95% CI = 0.40–0.69), 0.53 (95% CI = 0.41–0.68), 0.30 (95% CI = 0.13–0.68), respectively, $p < 0.05$). DISCUSSION/SIGNIFICANCE OF IMPACT: Our study showed that minority (AA and Hispanics), foreign born and uninsured with depression were less likely to use mental health services and/or antidepressant drug relative to other groups. Culturally and linguistically adapted intervention that involves community and providers to increase awareness about depression and the available services/treatment among minority, immigrant, and uninsured population are needed.

2520

Participant recruitment program at the University of Michigan CTSA

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OBJECTIVES/SPECIFIC AIMS: Across the Clinical and Translational Science Award (CTSA) Consortium, participant recruitment into clinical trials is essential to advance science. Without proper participant recruitment, clinical trials do not result in gains in scientific knowledge, wastes time, funds, and other resources (Mahon *et al.*, 2015). METHODS/STUDY POPULATION: Participant recruitment programs across the consortium are inconsistent in staffing, program services, and program goals. The participant recruitment program at the University of Michigan's (U-M) Michigan Institute for Clinical & Health Research (MICHR) provides expertise, tools, and resources to facilitate participant recruitment in clinical and health research studies. RESULTS/ANTICIPATED RESULTS: We will explain our program infrastructure, staffing, services, and discuss how we maintain an engaged registry with over 27,000 participants interested in research studies at U-M. DISCUSSION/SIGNIFICANCE OF IMPACT: Proper recruitment into clinical trials results in findings that are relevant for genetic, cultural, linguistic, racial/ethnic, gender, and age differences (Cottler *et al.*, 2013). We hope to share our best practices that aid in the development and success of participant recruitment across the CTSA Consortium.

2526

Using the multiphase optimization strategy to engineer an optimized STI preventive intervention among college students

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OBJECTIVES/SPECIFIC AIMS: The goal of this study is to develop an effective and efficient STI preventive intervention among college students following the principles and phases of MOST. METHODS/STUDY POPULATION As part of the preparation phase, an explicit conceptual model, drawing heavily on theory and prior research, was used to translate the existing science into 5 candidate intervention components (ie, descriptive norms, injunctive norms, expectancies, perceived benefits of protective behavioral strategies, and self-efficacy). For the optimization phase, in Fall 2016 all first-year students (n = 3547) from 4 universities were recruited to participate. Students were randomized to 1 of 32 different experimental conditions that included a combination of the candidate intervention components. Component effectiveness was evaluated using data from an immediate post-intervention survey on respective component mediators (eg, alcohol and sex-related descriptive norms). After a second factorial experiment (Fall 2017), only those intervention components that meet the pre-specified criteria of day $\geq$0.15 will be included in the optimized intervention. The evaluation phase will evaluate the effectiveness of the optimized STI preventive intervention via a randomized-control trial (Fall 2018). RESULTS/ANTICIPATED RESULTS: Preliminary results from the first factorial experiment suggest that descriptive norms and injunctive norms intervention components were significantly effective in reducing post-intervention perceived alcohol prevalence ($\beta = -0.28$, $p < 0.001$) and approval of alcohol ($\beta = -0.33$, $p < 0.001$), and sex-related norms ($\beta = -0.23$, $p < .001$). These results, in combination with process data, are being used to inform revisions of the intervention components to be included in a second factorial screening experiment. DISCUSSION/SIGNIFICANCE OF IMPACT: This study demonstrates how an iterative approach to engineering an STI preventive intervention using MOST can affect the behaviors of college students and serve as a foundation for other translational science.

2528

A community-academic partnership to understand the correlates of successful aging in place

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OBJECTIVES/SPECIFIC AIMS: The Rockefeller University-Center for Clinical and Translational Science and Clinical Directors Network (RU-CCTS/CDN) community-academic-partnership engaged with Carter Burden Center for the Aging (CBCA), a multisite senior community services organization serving Upper Eastside and East Harlem, NY, to develop community-engaged research. Many seniors served by CBCA are racial/ethnic minorities, live in poverty, suffer from multiple chronic conditions, depression, and food insecurity; there is no simple measure routinely used to characterize the health/health risks of program participants. Multiple biological, musculoskeletal, psychosocial and nutritional factors collectively contribute to frailty a construct that is variously defined, and has been used as a surrogate or predictor for health outcomes. Aim 1: We will engage seniors, CBCA leadership, New York City Department for the Aging, staff and other stakeholders in research priority-setting, joint protocol writing, research conduct, analysis and dissemination to cultivate a population of elder stakeholders interested in designing and participating in this and future research. Aim 2: We will characterize the health status of the resident and nonresident populations by collecting data across 3 sessions to include validated cardio-metabolic, musculoskeletal, chronic condition prevalence, quality of life, psychosocial, and nutritional assessments. METHODS/STUDY POPULATION: Stakeholders will be engaged through the process of Community Engaged Research Navigation and a series of meetings and exercises to refine priorities and research design, co-write the protocol, provide feedback on conduct, analyze and disseminate results of the project. RESULTS/ANTICIPATED RESULTS: Outcomes will include rates of participation and retention in assessments and engagement activities, themes from qualitative research, contributions to study design, placement of aims on the T0-T48 spectrum, social network analysis, classification of engagement on the spectrum of Community-based Participatory Research (CBPR) and partnership assessment. The primary outcome is frailty (6-minute walk test); We will examine associations among these measures with services utilization data captured electronically by CBCA. A key deliverable of this project will be a REDCap data capture platform that integrates and displays these measures that will be sustainable for CBCA. DISCUSSION/SIGNIFICANCE OF IMPACT: This practice-based research partnership will allow us to extract, replicate and extend the lessons learned about engaging stakeholders in generating hypotheses, operationalizing research, collecting and analyzing data, and disseminating results. The collaboration is built around generating and testing rigorous clinical an health services hypotheses that are derived from real-world practice-based needs and also incorporate basic science measures to embed and examine mechanistic hypotheses. Testing a simple to implement validated surrogate frailty measure will accelerate progress on evidence-based practices to test interventions that enhance healthy aging and serve as a model for future similar partnerships to form a network for community-based senior research. This work aligns with the RU-CCTS grant Hub Research goal to engage populations across the life span, including hard-to-reach and underserved populations, such as minority seniors.

2532

Predictive metabolism studies of varenicline and implications of its metabolites in nicotine addiction

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OBJECTIVES/SPECIFIC AIMS: The central goal is to predict the metabolites of varenicline and predictively evaluate their propensities for eliciting an increased binding effect in the brain. METHODS/STUDY POPULATION: Molecular modeling computational software and other cheminformatic tools present a strategic in silico strategy to predict a complete metabolic transformation for the varenicline molecule. Molecular docking tools help to highlight key interactions of the varenicline with key metabolizing enzymes that are differentially expressed across a population. This will assist in validating clinical models for smoking cessation. RESULTS/ANTICIPATED RESULTS: Differentialized binding results depending on whatever metabolite is produced. DISCUSSION/SIGNIFICANCE OF IMPACT: Products of metabolism of

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varenicline may differ in individuals and across groups, thus, binding effects and the propensity for adverse effects may differ in individuals.

2538

Artificial urinary sphincter (AUS) placement after failed urethral sling: Impact of sling removal and proximal cuff placement

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OBJECTIVES/SPECIFIC AIMS: Perineal urethral sling placement is an option for men with mild to moderate post-prostatectomy stress urinary incontinence (SUI). However, men with persistent incontinence after sling placement often require secondary artificial urinary sphincter (AUS) placement, made difficult by the sling occupying the proximal bulbar urethra. This proximal section has a thicker corpus spongiosum which may mitigate cuff-induced ischemia and subsequent urethral atrophy. The authors report a series of AUS placements after failed sling, using sling revision or removal to access the proximal urethra. METHODS/STUDY POPULATION: Cutting the sling arms during urethral cuff placement increased urethral exposure and mobility. If feasible, completely removing the sling allowed the most proximal cuff site; but if dissection was felt unsafe, the mesh was left in situ and the cuff placed distally. This study is a retrospective cohort design of patients with SUI who underwent AUS placement after failed sling from 2010 to 2016. Variables included baseline patient characteristics, SUI severity, intraoperative variables, and postoperative outcomes. AUS failure, defined as infection, erosion or urethral atrophy, was analyzed at 12 and 96 months using univariate and multivariable logistic regression. RESULTS/ANTICIPATED RESULTS: Over the study period, 29 patients underwent AUS placement after failed sling. At the time of AUS placement, mean urethral circumference was 6.2 cm and 68% of patients had a 4.5 cm cuff placed; no cases required a 3.5 cm cuff. Seventy-three percent of cases were after transobturator sling placement (27% bone-anchored) and 45% of slings were explanted. AUS failure rate at 12 and 96 months was 17.8% and 45%, respectively; atrophy was the most common indication. Prior transobturator sling placement had lower rates of both 12 month (9.1% vs. 57%, $p = 0.006$) and 96 month (36% vs. 71%, $p = 0.11$) failure, though the latter was not statistically significant. Sling explant was not a significant predictor of 12 month ($p = 0.12$) or 96 month failure ($p = 0.17$). DISCUSSION/SIGNIFICANCE OF IMPACT: Sling revision during AUS placement helps expose the wider proximal urethra, allowing larger cuff size placement. This procedure appears safe, with low rates of erosion and short-term failure—albeit with high rates of long-term urethral atrophy possibly due to more significant dissection causing devascularization. However, sling removal was not a significant predictor of failure. The transobturator sling's smaller profile may result in less trauma to urethra—possibly explaining the improved outcomes.

2542

Incidence of T3a up-staging and survival after partial nephrectomy: Size-stratified rates and implications for prognosis

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OBJECTIVES/SPECIFIC AIMS: Due to increased experience and favorable outcomes, the use of partial nephrectomy (PN) to treat renal cell carcinoma has grown in the past decade, with expansion to larger tumors. Performing PN for larger tumors could potentially increase the number of patients up-staged to pT3a after surgery, who may have instead been treated with radical nephrectomy (RN), if known preoperatively. We aimed to estimate the proportion of patients up-staged to T3a disease after PN stratified by size. We also compared size-stratified survival outcomes of up-staged patients to those with T1a, T1b, or T2 kidney cancer. METHODS/STUDY POPULATION: From 1998 to 2013, patients undergoing PN or RN were identified from Surveillance Epidemiology and End Results registries. The proportion of patients receiving PN found to have pT3a disease was quantified by size. Cox proportional hazards models compared cancer-specific (CSS) and overall survival (OS) for PN patients with pT1a, pT1b, and pT2 disease with appropriately size-stratified pT3a patients. Also, PN patients with pT3a disease were compared to size-stratified RN patients with pT3a disease. Comparisons by size were performed within pT3a patients receiving PN. RESULTS/ANTICIPATED RESULTS: From a total of 28,854 patients undergoing PN, the estimated proportion up-staged to pT3a increased along with increasing tumor size: 4.2% for T1a, 9.5% for T1b, and 19.5% for T2. Among patients receiving PN, adjusted survival analysis demonstrated worse CSS for up-staged pT3a patients Versus appropriately stratified pT1a (CSS: HR = 1.87, $p = 0.02$), pT1b (CSS: HR = 1.91, $p = 0.01$), and pT2 (CSS: HR = 2.33, $p = 0.01$) patients. However, when assessing OS, only the size-stratified comparison of up-staged pT3a Versus pT1a disease demonstrated worse OS for the up-staged cohort (OS: HR = 1.25, $p = 0.04$). Comparing PN and RN for pT3a disease, size-adjusted analysis revealed no statistical difference in CSS or OS. Lastly, among patients undergoing PN with pT3a disease, patients with larger tumors, measuring 4–7 cm (CSS: HR = 2.83, $p < 0.01$; OS: HR = 1.44, $p = 0.04$) or 7–16 cm (CSS: HR = 8.22, $p < 0.01$; OS: HR = 2.64, $p < 0.01$), experienced worse survival than those with smaller pT3a tumors, <4 cm. DISCUSSION/SIGNIFICANCE OF IMPACT: A greater proportion of patients appear to experience T3a up-staging after PN with increasing initial T stage. Up-staged pT3a patients have worse cancer specific survival after PN compared to those with similarly sized localized tumors. Furthermore, the up-staged pT3a patients after PN appear to experience similar survival to pT3a patients undergoing RN. However, pT3a patients undergoing PN had worse survival with increasing tumor size, reinforcing the need for improvements in preoperative staging and identifying patients at risk of up-staging.

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