increased again from T2 to T3, suggesting a possible role for these lipids during the later stages of pregnancy. The fatty acids showing this trend included key fatty acids- Linoleic Acid, Arachidonic Acid, Alpha-linolenic acid, Eicosapentaenoic acid, Docosapentaenoic acid, Docosahexaenoic acid. DISCUSSION/SIGNIFICANCE: Mapping lipid trends during pregnancy could lend support to a precision health approach to reduce perinatal health disparities among pregnant Black women. The findings from this study will be used to identify biomarkers and study associations with social and environmental factors responsible for adverse perinatal outcome in pregnant Black women.

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Depression Moderates Independent Effects of Daily Natural Light Exposure and Activity on Daily Mood

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OBJECTIVES/GOALS: Ambulatory methods are useful tools to study physical and mental health in everyday life. While many studies show daily activity improves mood, the effects of daily light exposure on mood remain unknown. This study evaluated the effects of daily natural light exposure and activity on daily mood and evaluate whether depression moderate effects. METHODS/STUDY POPULATION: 82 adults with lifetime major depression disorder (25 current) and 49 healthy controls were recruited from the greater Chicago community (N = 131, 62% female, age M = 30.15, SD = 9.94). At baseline, participants completed the Inventory of Depression and Anxiety Symptoms to measure depression symptoms of anhedonia, or loss of pleasure. Positive and negative affect were then measured 3x daily for 14-days via self-report using smartphones while light exposure and activity were continuously recorded from a wrist-worn actigraphy device. Following prior studies, daily natural light exposure was measured as the total number of white light samples greater than 1000 lux each day. Multilevel models were used to separate within-person (daily level) from between-person (subject level) effects. RESULTS/ANTICIPATED RESULTS: Results revealed daily within-person activity ($p < .001$) and natural light exposure duration ($p = .035$) were independently associated with increased positive affect. Effects were significantly moderated by baseline anhedonia symptoms (3-way interaction: $p = .004$). Natural light exposure duration only increased positive affect on lower activity days for high anhedonia and higher activity days for low anhedonia (ps < .018). Significant results remained controlling for between-person light and activity, time of year, age, sex, negative affect, and baseline general depression symptoms. Compared to one's own daily averages, daily activity and natural light exposure may be independent pathways to boost positive affect, especially for individuals with high anhedonia symptoms. DISCUSSION/SIGNIFICANCE: Results suggest daily natural light exposure may be an accessible, low-cost alternative to independently increase positive affect in depression on days when activity is low. Translational applications are discussed focusing on transdiagnostic implications for physical and mental health conditions that disrupt mood and limit activity.

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Creating Pragmatic Tools for Reliable Kidney Function Measurement in Patients with Kidney Impairment

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OBJECTIVES/GOALS: Estimating kidney function for drug dosing poses safety and efficacy concerns with critical medications. This study aims to develop a pragmatic method for measuring kidney function, ensuring that critical clinical decision points based on kidney function are universally applicable to all patients, leading to improved health outcomes. METHODS/STUDY POPULATION: This is a single-dose pharmacokinetic (PK) study to evaluate the concordance between iopamidol- and iohexol-measured glomerular filtration rate (mGFR), as determined by their respective serum clearances, in a cohort of 24 adults with varying kidney function. Participants with estimated glomerular filtration rates (CKD-EPI eGFRcr) ranging from >30 to 120 mL/min will be recruited from the Michigan Medicine health system. Enrolled participants will be stratified into 3 kidney function groups based on conventual kidney dosing considerations. IV micro doses of iohexol and iopamidol will be administered, followed by blood sampling. PK analysis will be used to compare the clearance of these substances. The agreement between iohexol and iopamidol in measuring GFR will be assessed via bioequivalence analysis. RESULTS/ANTICIPATED RESULTS: We expect no statistically significant difference between iopamidol and iohexol CL due to the high similarity of iopamidol and iohexol molecular and PK properties. We also expect that the ordinary least square regression analysis of iopamidol mGFRand iohexol mGFR will show limited variability across GFR measurements. These expected results will support the use of iopamidol as a marker of mGFR and its interchangeability with the gold standard iohexol. DISCUSSION/SIGNIFICANCE: Addressing eGFR errors is crucial for accurately dosing critical medications. This study aims to develop a novel mGFR methodology that accommodates various kidney function levels. This will enable precision dosing and streamline clinical trials. It also eliminates biological variability, enhancing generalizability and health outcomes.

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Development of Machine Learning Algorithms to Predict Symptomatic VTE at Time of Admission and Time of Discharge after Severe Traumatic Injury

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OBJECTIVES/GOALS: Clinical indicators predictive of venous thromboembolism (VTE) in trauma patients at multiple time points are not well outlined, particularly at time of discharge. We aimed to describe and predict inpatient and post-discharge risk factors of VTE after trauma using a multi-variate regression model and best of class machine learning (ML) models. METHODS/STUDY POPULATION: In a prospective, case-cohort study, all trauma

https://doi.org/10.1017/cts.2024.394

patients (pts) who arrived as level 1 or 2 trauma activations, from June 2018 to February 2020 were considered for study inclusion. A subset of pts who developed incident, first time, VTE and those who did not develop VTE within 90 days of discharge were identified. VTE were confirmed either by imaging or at autopsy during inpatient stay or post-discharge. Outcomes were defined as the development of symptomatic VTE (DVT and/or PE) within 90 days of discharge.A multi-variate Cox regression model and a best in class of a set of 5 different ML models (support-vector machine, random-forest, naives Bayes, logistic regression, neural network]) were used to predict VTE using models applied a) at 24 hours of injury date or b) on day of patient discharge. RESULTS/ANTICIPATED RESULTS: Among 393 trauma pts (ISS=12.0, hospital LOS=4.0 days, age=48 years, 71% male, 96% with blunt mechanism, mortality 2.8%), 36 developed inpatient VTE and 36 developed VTE after discharge. In a weighted, multivariate Cox model, any type of surgery by day 1, increased age per 10 years, and BMI per 5 points were predictors of overall symptomatic VTE (C-stat 0.738). Prophylactic IVC filter placement (4.40), increased patient age per 10 years, and BMI per 5 points were predictors of post-discharge symptomatic VTE (C-stat= 0.698). A neural network ML model predicted VTE by day 1 with accuracy and AUC of 0.82 and 0.76, with performance exceeding those of a Cox model. A naïve Bayesian ML model predicted VTE at discharge, with accuracy and AUC of 0.81 and 0.77 at time of discharge, with performance exceeding those of a Cox model. DISCUSSION/SIGNIFICANCE: The rate of inpatient and post-discharge VTEs remain high. Limitations: single institution study, limited number of patients, internal validation only, with the use of limited number of ML models. We developed and internally validated a ML based tool.Future work will focus on external validation and expansion of ML techniques.

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Enhancing Cell Infiltration and Controlled Growth Factor Release for a Customized 3D-Printed Bone Graft Composite

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OBJECTIVES/GOALS: Annually, 1.5 million global patients receive maxillofacial reconstruction. The gold standard, involving bone particulate, lacks reproducibility. To improve this, we have developed a custom 3D-printable, porous cover-core design. This study optimizes the hydrogel core properties and growth factor (GF) release for enhanced bone regeneration. METHODS/STUDY POPULATION: Different ratios of Methacrylated Gelatin (GelMa), Methacrylated Alginate (AlgMa) and tricalcium phosphate (α^2-TCP) were combined to optimize cell viability, GF sequestration and mechanical stability. Material characterization was performed using a rheometer to determine the viscoelastic properties of the blends. Release from disks loaded with FGF-containing PLGA microparticles was quantified with an ELISA kit. Furthermore, scanning electron microscopy (SEM) was conducted to quantify hydrogel porosity. In vitro studies were performed using NIH 3T3 murine fibroblasts in Corning Transwells while immunofluorescent, metabolic and osteogenic studies were performed in 96 well plates to investigate cell infiltration, cell adhesion, viability and differentiation, respectively. RESULTS/ANTICIPATED RESULTS: By adjusting the AlgGelMa ratio, we manipulated matrix properties. GelMa possesses excellent durability and cell adhesion due to intrinsic RGD-binding motifs. AlgMa enhanced swelling by 30%, growth factor sequestration by 50% in 24hrs, and matrix storage modulus without increasing the loss modulus which could cause cell migration away from the hydrogel. Varying the AlgGelMa ratio lowered pH, promoted cell infiltration, and reduced fibronectin accumulation. The addition of β-TCP is anticipated to improve cell differentiation towards an osteogenic lineage due to improved elastic modulus, calcium and phosphate ion concentration improving mineral deposition. DISCUSSION/SIGNIFICANCE: These findings suggest through the use of this composite, early cell infiltration can be increased and promoted due to FGF release, leading to increased osteointegration. Our porous cover-core design ensures efficient clot integration and early cell infiltration, enhancing osteointegration through FGF release.

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Preoperative SD and Depression, In Isolation and Combined, Are Predictors of 12-Month Disability and Pain after Lumbar Spine Surgery

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OBJECTIVES/GOALS: To examine the individual and combined association between preoperative sleep disturbance (SD) and depression and 12-month disability, back pain, and leg pain after lumbar spine surgery (LSS). METHODS/STUDY POPULATION: We analyzed prospectively collected multi-center registry data from 700 patients undergoing LSS (mean age=60.9 years, 37% female, 89% white). Preoperative SD and depression were assessed with PROMIS measures. Established thresholds defined patients with moderate/severe symptoms. Disability (Oswestry Disability Index) and back and leg pain (Numeric Rating Scales) were assessed preoperatively and at 12 months. We conducted separate regressions to examine the influence of SD and depression on each outcome. Regressions examined each factor with and without accounting for the other and in combination as a 4-level variable. Covariates included age, sex, race, education, insurance, body mass index, smoking status, preoperative opioid use, fusion status, revision status, and preoperative outcome score. RESULTS/ANTICIPATED RESULTS: One hundred thirteen (17%) patients reported moderate/severe SD alone, 70 (10%) reported moderate/severe depression alone, and 57 (8%) reported both moderate/severe SD and depression. In independent models, preoperative SD and depression were significantly associated with 12-month outcomes (all p's<0.05). After accounting for depression, preoperative SD was only associated with disability, while preoperative depression adjusting for SD remained associated with all outcomes (all p's<0.05). Patients reporting both moderate/severe SD and moderate/severe depression had 12.6 points higher disability (95%CI=7.4 to 17.8) and 1.5 points higher back (95% CI=0.8 to 2.3) and leg pain (95%CI=0.7 to 2.3) compared to patients with no/mild SD and no/mild depression. DISCUSSION/SIGNIFICANCE: Preoperative SD and depression are independent predictors of 12-month disability and pain when considered in isolation. The combination of SD and depression impacts postoperative outcomes considerably. The high-risk group of patients with moderate/severe SD and depression could benefit from targeted treatment strategies.

https://doi.org/10.1017/cts.2024.394