89

Bridging Cell Biology and Engineering Sciences: Interdisciplinary Team-based Training in Computational Pathology[††]

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OBJECTIVES/GOALS: Computational pathology is an emerging discipline that resides at the intersection of engineering, computer science, and pathology. There is a growing need to develop innovative pedagogical approaches to train future computational pathologists who have diverse educational backgrounds. METHODS/STUDY POPULATION: Our work proposes an iterative approach toward teaching master's and Ph.D. students from various backgrounds, such as electrical engineering, biomedical engineering, and cell biology the basics of cell-type identification. This approach is grounded in the active learning framework to allow for observation, reflection, and independent application. The learners are trained by a team of an electrical engineer and pathologist and provided with eight images containing a glomerulus. They must then classify nuclei in each of the glomeruli as either a podocyte (blue), endothelial cell (green), or mesangial cell (red). RESULTS/ANTICIPATED RESULTS: A simple web application was built to calculate agreement, measured using Cohen's kappa, between annotators for both individual glomeruli and across all eight images. Automating the process of providing feedback from an expert renal pathologist to the learner allows for learners to quickly determine where they can improve. After initial training, agreement scores for cells scored by both the learner and the expert were high (0.75), however, when including cells not scored by both the agreement was relatively low (0.45). This indicates that learners needed more instruction on identifying unique cells within each image. This low-stakes approach encourages exploratory and generative learning. DISCUSSION/SIGNIFICANCE: Computation medical sciences require interdisciplinary training methods. We report on a robust approach for team-based mentoring and skill development. Future implementations will include undergraduate learners and provide opportunities for graduate students to engage in near-peer mentoring.

90

Developing a Clinical and Translational Research Pathway Across Three Health Sciences Disciplines

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OBJECTIVES/GOALS: The design and phased roll-out of a CTSA competency-based longitudinal Clinical and Translational Research (CTR) curriculum pathway that can be integrated into the training of health sciences professional degree programs at three regional institutions.

The outcome will be an increased number of health science professionals participating in CTR. METHODS/STUDY POPULATION: Based on an environmental scan, student surveys to assess interest, and feedback from regional stakeholders, a CTR pathway program was developed. The pathway curriculum will be grounded in 6 key focus areas derived from the Core Competencies in Clinical and Translational Research and prioritized based on regional need. The CTR pathway is currently being developed for the University of Washington School of Medicine, with additional implementations at the Washington State University School of Pharmacy and the Montana State University School of Nursing. Students will complete training modules and a mentored research project that is integrated into their specific course of study. RESULTS/ANTICIPATED RESULTS: In addition to the initial assessments and curriculum, an Advisory Committee will be established. Mentors, site leads, and research project partnerships across the region will be identified. Modifications will be made according to the local needs at both Montana State University and Washington State University. After the pilot launch and roll-out, the pathway curriculum will be adapted for other disciplines based on input from content experts and pathway evaluation data. Student retention in CTR fields will be tracked, with a goal to increase the number of CTR investigators and professionals across WWAMI in the next decade. CTR pathway processes and training resources will be shared with the CTSA consortium and other health sciences professional training sites. DISCUSSION/SIGNIFICANCE: Development of the CTR workforce is a priority to increase national capabilities in clinical and translational science. Building on a recognized need for targeted and longitudinal engagement, a CTR pathway is being established for health sciences students in the WWAMI region.

91

Educating the Clinical and Translational Research Workforce Online: A Case Study of Tufts CTSI I LEARN

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OBJECTIVES/GOALS: In November 2020, Tufts CTSI launched a new, upgraded learning management platform for disseminating self-paced online professional education for the CTR workforce. This poster will present a case study of the first two full years of Tufts CTSI I LEARN usage to illustrate how a local and national CTR workforce engages in free online training. METHODS/STUDY POPULATION: This study will employ a retrospective analysis of 2021 and 2022 learner usage data from the Tufts CTSI I LEARN platform. The population are individuals who have engaged in one or more courses over the specified time period, where engagement is defined as having viewed at least one content item in a course. Descriptive statistics will be used to show total engagement and unique learners each year by course, popular courses by year, as well as geographical distribution of learners across both years. Two sample t-tests will be used to compare the mean percentage of course completion and mean time spent in courses for 2021 and 2022. The Wilcoxon Rank Sum test will be used to compare median courses taken per learner each year. Finally, descriptive statistics will be used to show returning learners vs new learners from 2021 to 2022. RESULTS/ANTICIPATED RESULTS: Data from 2021 show 723 learners (436 unique) engaged in 49 courses across the year. Course engagement ranged from a max of 135 to minimum of 1 learner (Mean = 14.8, Median = 6). Mean percent of course content viewed was 69.4 (Median = 63.7%) and mean time spent on course content was 41.3 minutes (Median = 33.6). Preliminary data from Q1-Q3 of 2022 find 557 learners (328 unique) have engaged in 69 courses. Based on this trend, it is anticipated that 2022 will match or exceed 2021 engagement levels. Recently launched

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courses are expected to have higher average engagement than legacy courses ported from the previous version of the platform. DISCUSSION/SIGNIFICANCE: Results from this evaluation will suggest strategies to enhance engagement in current courses and identify opportunities for future course development. Increasing engagement in self-paced CTR education is an important complement to formal workforce development and training programs.

92

Effectiveness of an Academic Medical Center Clinical Research Coordinator Intern Program on Learning and Workforce Expansion

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OBJECTIVES/GOALS: The Clinical Research Coordinator (CRC) Intern Program was developed to increase knowledge and awareness of CRC's vital role in conducting clinical studies. Program outcomes are to provide students with marketable skills and knowledge leading to employment within the clinical research ecosystem. METHODS/STUDY POPULATION: The CRC Intern Program is available to college students for health-related academic courses requiring an internship component. Didactic and experiential learning are incorporated into the program with students imbedded within well-established clinical research teams. Activities include attending IRB meetings, recruitment and enrollment, data collection and entry, and regulatory items. Students complete knowledge pre- and post-assessments (Competency Index for Clinical Research Professionals-CIRCP) via REDCap surveys to assess learner knowledge acquisition and program effectiveness. Demographic, program evaluation, and 3-month follow up survey data are analyzed using descriptive statistics. RESULTS/ANTICIPATED RESULTS: Beginning in Spring 2022, the Intern Program has accepted 9 students with 5 completing the program, with 2 of this 5 having been offered employment as CRCs. Preliminary CIRCP assessment data indicates increased CRC knowledge upon Intern Program completion. Demographic data shows that students are mostly female and non-white (43% African American, 29% Hispanic). Additional results from the current cohort will be shared upon program completion. Of note is the development of partnerships with local colleges, including community colleges, to build awareness of the CRC career path and to provide opportunities for CRC exploration resulting in expansion and diversification of the clinical research workforce. DISCUSSION/SIGNIFICANCE: There is an industry wide shortage of CRCs. Our internship program has provided an effective method to expand and diversify the CRC workforce through knowledge acquisition and application building CRC skills and competencies. Lessons learned and future plans for intern expansion will be discussed.

93

Empowering the Next Generation of Clinical & Translational Scientists

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OBJECTIVES/GOALS: Biomedical research fields are facing the challenges of demand for skilled workers as well as challenges related to diversity in that workforce. It is important that the healthcare workforce reflect the population it serves. The Exposures Internship seeks to address this by building pathways for youth to pursue careers in research and medicine. METHODS/STUDY POPULATION: In 2021, the Yale Cultural Ambassadors expressed concern about the lack of free high quality, educational offerings for youth that summer. They asked YCCI to consider developing a summer program for students aged 15 and older that focused on spurring interest in careers in healthcare, medicine, and clinical and translational research. The result was a 4-week virtual learning experience for 34 interns who met daily via Zoom and participated in course work, lectures, journal clubs, group projects, and virtual lunches with internationally renowned clinical research and healthcare leaders. Sessions were designed to help interns gain knowledge of and exposure to current topics in clinical and translational science and to observe the various steps of proposing, designing, undertaking, and analyzing clinical trials. RESULTS/ANTICIPATED RESULTS: YCCI received over 900 inquiries from around the world with more than 200 completed applications for participation in the internship for the pilot year. Since then, YCCI leadership has worked with community partners to engage young scholars from 17 different states, Canada, Mexico and Puerto Rico. Of those, we estimate 75% are minority, ~50% female and 20% from rural areas with limited similar opportunities. During the four weeks of the program these highly motivated students worked on projects aimed at increasing participation in pediatric research through a revised Informed consent and adolescent assent process and a youth centered awareness campaign. Interns were so inspired that they requested the program be continued beyond the initial four weeks. As such, YCCI continued to offer sessions throughout the year. DISCUSSION/SIGNIFICANCE: In evaluation of the pilot program 95% of respondents strongly agreed that the program exposed them to new information about clinical and translational research. One intern shared, This program has unquestionably made me consider becoming a researcher in the future with the goal of becoming a principal investigator within my interest in medicine.

94

Evaluation of a grant writing workshop designed to increase submission and award rates for career development awards

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OBJECTIVES/GOALS: To improve early career faculty members' NIH grant writing skills, Clinical and Translational Science Awards (CTSA) hubs have developed a variety of workshop-style programs. However, few articles have evaluated the impact of grant writing workshops on NIH grant submission and award rates. METHODS/STUDY POPULATION: The K Writing program was developed by the Michigan Institute for Clinical and Health Research (MICHR) at the University of Michigan. Since 2012, 435 scholars have participated in the program. The MICHR K Writing program is a three-part workshop series that prepares scholars by providing them with guidelines to write all sections of a career development grant application. Each session focuses on different sections of the K award proposal. During the workshop sessions, participants break into small groups and exchange drafts of their proposal sections and receive peer critique and feedback from senior faculty facilitators who have experience with NIH study sections. RESULTS/ANTICIPATED RESULTS: Between 2012-2018, 273 scholars participated and 57% were female. Our two primary outcomes of