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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.

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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.

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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.

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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

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 developed 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.

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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 interdisciplinary 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 TLI 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 TLI 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.

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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.

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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 CTSA's 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