

September 2021. The application process required participants to provide an initial self-assessment of research skills and a proposed research question. 25 clinicians applied to the program, 11 were accepted, and 9 enrolled. All clinicians in the initial cohort were clinical faculty physicians. Because of the geographical distance of participants as well as the ongoing pandemic, the course used a blended learning approach with both synchronous and asynchronous learning. Participants viewed online lectures on core content coupled with live virtual sessions with opportunities for discussion and application of the content. Relevant CTSI and institutional resources were highlighted in each session. RESULTS/ANTICIPATED RESULTS: Of the 9 clinician participants who enrolled in Research 101, the average attendance per session was 67% or 6 people. 89% or 8 participants attended five or more sessions. 5 participants submitted a letter of intent for the annual CTSI Pilot grant program, and of the five, two were invited to submit a grant application. Formal evaluation of the program is currently ongoing and will close on November 30th, at which time full results will be available. Research competencies will be assessed through a pre-post comparison, each self-rated by course participants. Additionally, participants were asked to provide input on the most and least valuable components of the course, as well as any open-ended feedback. Research 101 leadership will use these results to improve the course for future participants. DISCUSSION/SIGNIFICANCE: A learning health system (LHS) is recognized as an essential means by which research evidence is translated into practice. Important to realizing the LHS vision is the engagement of clinicians into the generation and translation of research into practice. Research 101 is an important way to bolster clinician engagement in translational research.

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Translational Science Competencies in a Virtual CTSA Internship Program

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OBJECTIVES/GOALS: The Workforce Development Core of the New Jersey Alliance for Clinical and Translational Science (NJ ACTS) has developed an internship program for students to engage in virtual research projects across the CTSA Hub. We sought to evaluate how intern projects within NJ ACTS align with the competencies needed for translational science. METHODS/STUDY POPULATION: Core leads and researchers within NJ ACTS developed 34 projects that were completed by individual interns or pairs of interns. Forty-two professional, undergraduate, and graduate students across the 3 Hub institutions have completed semester-long intern projects. Intern mentors mapped their projects to the C-COMEND competency profile for translational scientists which were further aligned with the seven fundamental character traits defined by Translation Together. RESULTS/ANTICIPATED RESULTS: More than 75% of intern projects addressed the C-COMEND competencies in Personal Development, Communication and Dissemination, Project Management and Time Management. Few projects (< 10%) focused on skills related to preclinical or clinical research. The competencies needed for development as a Rigorous Researcher were most consistently addressed in the intern projects. Additionally, intern projects fostered a number of skills needed for becoming a Domain Expert and Skilled Communicator. DISCUSSION/

SIGNIFICANCE: Taken together, a virtual internship program can be designed to introduce and/or refine the competency skills needed for translational science.

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The implementation and impact of a mentored professional development program for clinical and translational research staff.

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OBJECTIVES/GOALS: The objective of this evaluation is to show how the STEP.UP program promoted the professional development at Michigan Medicine by providing clinical and translational research staff an experienced research staff mentor in a structured 9-month program. METHODS/STUDY POPULATION: Participant and mentor data was collected from application forms, online surveys, and interviews with both participating mentors and mentees. Validated assessments of mentoring competencies were administered. Participants were tracked over a period of four years with regular reviews of institutional records. Mentor and mentor data was also collected at the point of application each year and the application forms were aligned with NIH definitions for under-represented populations in science in 2020. As part of a process of continuous programmatic improvement, a STEP.UP Advisory Board consisting of senior research staff and past mentors was involved in the identification, operationalization and evaluation of programmatic outcomes and is involved in the ongoing governance of this mentoring program. RESULTS/ANTICIPATED RESULTS: Four cohorts of mentees and mentors have participated in this program since its inception. Mentees gained the greatest abilities in, Active listening, Establishing a relationship based on trust, Considering how personal and professional differences may impact expectations, and Working effectively with mentors/mentees whose personal background is different. Mentees reported the program contributed to their Career planning, Professional advancement, networking, personal growth, professional networks, and communication skills. Mentors reported learning about new professional techniques and areas of expertise. As of 2021, 75% the first cohort changed their job-classification since participating as did 25% of the second cohort and 100% of mentees have maintained research careers. DISCUSSION/SIGNIFICANCE: The creation of this program in 2019 marked the beginning of a novel professional development opportunity at Michigan Medicine. The evaluation results show how STEP.UP contributes to advancing clinical and translational study teams and how it can inform and the identification of best practices in clinical and translational workforce development.

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A high-fidelity globe and orbit surgical simulator for ophthalmologic surgical training*

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OBJECTIVES/GOALS: Many ophthalmologic procedures involve operating on or manipulating the globe and bony orbit. Creating

an anatomically accurate globe and orbit is of interest to improve surgical education for trainees. The purpose of this study was to create a high-fidelity globe and orbit model using synthetic materials and utilizing 3D-printing techniques. **METHODS/STUDY POPULATION:** A deidentified computed tomography scan of the head and neck was digitally rendered and segmented using Mimics and 3-Matic (Materialise NV, Belgium) to create a digital model of the bony orbit. The model was 3D printed using a stereolithographic 3D-printer (Formlabs, Somerville, MA). The globe was created by soaking a large water bead made from a water absorbing polymer (YIQUDUO, China) for 24 hours. The water bead was then coated consecutively with three layers of silicone (Smooth-On, Macungie, PA). A standard sausage casing was hydrated and encased around the water bead, representing the conjunctiva. The globe was placed into the 3D-printed orbit. An incision was made in the sausage casing and the defect was sutured by one ophthalmologist. **RESULTS/ANTICIPATED RESULTS:** The bony orbital anatomy was accurately represented by stereolithographic printing. The size and feel of the artificial globe was similar to that of an in vivo human globe. The incised sausage casing covering the globe was able to be manipulated and sutured using a 8-0 suture in a microsurgical environment. The sausage casing had high-fidelity characteristics of an in vivo human eye conjunctiva. **DISCUSSION/SIGNIFICANCE:** This model can be used for teaching of conjunctival suturing for ophthalmologic trainees. By use of easily obtained materials for the globe, this model has the potential to standardize teaching methods of challenging techniques, and can reduce the need for animal and human tissue procurement, which is the current standard for ophthalmologic teaching.

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Evaluating the long-term impact of a practice-oriented research training program for clinical and translational research staff

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OBJECTIVES/GOALS: The objective of this evaluation is to evaluate the long-term impact of the PORT program on the clinical and translational research careers of the participating research staff. The impact of the program is best demonstrated through measures of the scientific contributions of the participants as well as their professional advancement over time. **METHODS/STUDY POPULATION:** The PORT program participants were tracked through the collection of instructional and public records, including the collection of their subsequent grant and publications. The clinical and translational research careers of the participants was also assessed, using a measure adapted from the operational guidelines for NCATS' Research Careers Common Metric. A survey was administered to part participants and interviews conducted with participants from the past cohorts. **RESULTS/ANTICIPATED RESULTS:** The evaluation results demonstrate the PORT program participants made substantial contributions to the advancement of clinical and translational research, particularly through their publication of hundreds of scientific works. In addition, the evaluation results reveal that the program had short-, intermediate- and

long-term impact on their research careers, thereby contributing to the advancement of the health research workforce at the University of Michigan for well over a decade. Specific participant cases highlight how individuals utilized their experience and training to advance research agendas and their long-term careers at the institution. These findings can inform the development, implementation and evaluation of similar programs throughout the CTSA consortium and beyond. **DISCUSSION/SIGNIFICANCE:** Most evaluations of research training and award programs for clinical and translational research staff do not evaluate the long-term impact of CTSA support on the research careers of the participants. The findings of this evaluation can help inform the development of new and more effective workforce development initiatives with long-term impact.

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The use of visual arts to teach complex ideas on non-binary sex/gender traits and identities.

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OBJECTIVES/GOALS: Recent scientific discoveries show that human sex determination and differentiation is a spectrum of developmental processes and that sex/gender traits and identities not always fit binarity. This study aims to determine whether the visual arts can effectively transmit these complex scientific ideas on sex and gender variance. **METHODS/STUDY POPULATION:** A one-hour lecture for undergraduate students enrolled in a behavioral neuroendocrinology course included 17th century Spanish paintings and representative work from contemporary LGBTQIA+ artists in photography. Pre and post self-evaluation was conducted through five multiple choice questions. Chi Square test was employed for statistical analysis, which required elimination of no responses from item analysis. Statistical significance was defined as p value < 0.05 . Three artistic images and two scientific images were included in the questions. Acquisition of content-specific knowledge on diverse body configurations, differences of sex development (DSD), transsexuality, histopathology of the gonad and neuroanatomy of the hypothalamus was evaluated. **RESULTS/ANTICIPATED RESULTS:** Twenty students completed the online pre- and post-test. We found that a 17th century Spanish painting was effective at making the distinction between transsexuality and intersexuality ($p < 0.0005$). Similarly, an artistic image that reinterprets the Vitruvius Man was effective for presenting the argument that diverse body configurations does not imply clinical pathology ($p < 0.0001$). Last, a scientific image showing the histopathology of an ovotestis was effective for introducing undergraduate students to diagnostic criteria for DSD ($p < 0.02$). No significant differences were found in the use of an artistic photograph depicting a young female to male transsexual individual nor in the use of a scientific image showing the neuroanatomical localization of the hypothalamus. **DISCUSSION/SIGNIFICANCE:** The learning of complex scientific concepts on human sex determination and differentiation can be affected by preconceived ideas, values, and attitudes towards