

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.

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### 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.

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### 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.

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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### **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.

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### **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 constraints. 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.

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### **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.