

monthly seminar series, multilevel mentoring, targeted coursework, and networking. **METHODS/STUDY POPULATION:** Over 10 program years, we collected survey data on characteristics of CEED Scholars, such as race, ethnicity, and current position. We created a matched set of URB trainees not enrolled in CEED during that time using propensity score matching in a 1:1 ratio. **RESULTS/ANTICIPATED RESULTS:** Since 2007, CEED has graduated 45 Scholars. Seventy-six percent have been women, 78% have been non-White, and 33% have been Hispanic/Latino. Scholars include 20 M.D.s and 25 Ph.D.s. Twenty-eight CEED Scholars were matched to non-CEED URB students. Compared with matched URB students, CEED graduates had a higher mean number of peer-reviewed publications (9.25 vs. 5.89;  $p < 0.0001$ ) were more likely to hold an assistant professor position (54% vs. 14%;  $p = 0.004$ ) and be in the tenure stream (32% vs. 7%;  $p = 0.04$ ), respectively. There were no differences in Career Development Awards ( $p = 0.42$ ) or Research Project Grants ( $p = 0.24$ ). **DISCUSSION/SIGNIFICANCE OF IMPACT:** Programs that support URB researchers can help expand and diversify the biomedical research workforce. CEED has been successful despite the challenges of a small demographic pool. Further efforts are needed to assist URB researchers to obtain grant awards.

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### Teaching rigor, reproducibility, and transparency using gamification

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**OBJECTIVES/SPECIFIC AIMS:** The objectives for the Rigor, Reproducibility, and Transparency course within KAIZEN-Edu was to provide a platform that allows essential training, in a novel and customizable approach, for a large number of students across the multiple institutions within the UAB CCTS Partner Network. Successful implementation across this geographically diverse of partner institutions would serve as proof of concept to future dissemination across the CTSA consortium. **METHODS/STUDY POPULATION:** We used the “build a game” tools within Kaizen-Edu to design the “Rigor and Reproducibility Game.” The games consisted of four modules, with 20 questions designed to test participant knowledge, and edify learners on particular concepts through a multimedia approach (embedded video, text, and hyperlinks to articles) with content provided as questions released over 4 weeks. Researchers from across the UAB CCTS Partner Network developed comprehensive modules for (1) How Scientists Fool Themselves/Scientific Premise, (2) Authentication of Chemical and Biologic Resources and Sex and Other Biologic Variables, (3) Statistical Rigor, and (4) Comprehensive Review. A typical week began with review articles (1–2) sent to each participant. The participants are informed that 5 questions will be released midweek testing the key concepts from the papers. When ready, the participant logs into Kaizen-Edu and starts to answer questions/play the game. Immediately, the articles are opened for reference, followed by a brief 4–5 minute video which reinforces key concepts and then timed questions begin. A typical question is allowed 3 minutes (visible countdown clock). Accurate responses result in the addition of points, with double points awarded for correct answers within the questions time limit. No points are awarded for incorrect answers. After each question, a detailed explanation reviews and reinforces the key concepts. Each participants' points contribute to both their individual score and team scores, which influences their position on the Rigor and Reproducibility game leaderboard. **RESULTS/ANTICIPATED RESULTS:** Within 2017, the Rigor Reproducibility, and Transparency course was conducted 5 times. A total of 126 researchers across 9 institutions were enrolled. A total of 87 enrollees completed the full course, with 80% passing (answering  $\geq 75\%$  of questions correctly) on their first attempt and an additional 20% passing on a second attempt. The distribution of completers across the CCTS Network was UAB = 48, Auburn = 13, Pennington = 10, University of Alabama = 5, Hudson Alpha = 5, Tulane = 4, University of South Alabama = 1, LSU = 2, and Southern Research = 1. Researchers throughout at Partner Institutions represent 46% of the total population trained. **DISCUSSION/SIGNIFICANCE OF IMPACT:** This software based, gamification-enhanced course was broadly accepted with each session fully enrolled, and learners spread almost evenly between our institution and various Partner Network sites. Our pilot proved that gamification was an effective technique to engage users and produced a high pass rate, suggesting that the content both engaged learners and was effectively internalized. Educational interventions, imbued with principles of gamification provide educators powerful tools that use competition and/or collaboration to disseminate knowledge, engage learners with content, and save educator time as created game content can be reused in additional educational sessions. Analyses of the data trail provided by users engaging with such electronic learning tools will provide educators will insights on how to maximize learning, opening the door to an era of educational analytics.

2007

### The clinical research operations program: Educating clinical research staff

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**OBJECTIVES/SPECIFIC AIMS:** The Clinical Research Operations Program is a free educational program designed to educate clinical research personnel on the conduct of clinical research (CR). The participant completes 16 required core sessions (24 h), 4 elective sessions (4 h), and passes the final exam to receive a certification in CR operations at Stanford. Sessions focus on the 9 domains of CR (established by the Joint Task Force for Clinical Trial Competency), such as Ethical & Participant Safety Considerations, Clinical Study Operations, & Data Management/Informatics. **METHODS/STUDY POPULATION:** Sessions are taught by volunteer lecturers. Participants may also attend the sessions without pursuing the certification. The program objective is to provide easy-access education in CR in order to increase regulatory compliance, staff retention, and improve CR at Stanford. The program targets CR coordinators, however, staff, postdocs, fellows, and faculty also participate. **RESULTS/ANTICIPATED RESULTS:** Since the program's launch in January 2017, 119 individuals have enrolled in the certification program. The most represented group is the Department of Medicine. Sessions consistently reach their maximum with a waiting list. Each core session requires that the participant complete an evaluation (Likert scale, 1–5) of the registration process (4.5/5), the class environment (4.6/5), the presented content (4.5/5), and the instructor (4.6/5). Data from these evaluations are positive to date and is used to continually refine the program. **DISCUSSION/SIGNIFICANCE OF IMPACT:** N/A.

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### The leveling of clinical research competencies

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**OBJECTIVES/SPECIFIC AIMS:** Objectives/goals: Describe the process used to develop leveled competencies and associated examples. Discuss the final leveled competencies and their potential use in clinical research professional workforce initiatives. **METHODS/STUDY POPULATION:** The revised JTFCTC Framework 2.0 has 51 competency statements, representing 8 domains. Each competency statement has now been refined to delineate fundamental, skilled or advanced levels of knowledge and capability. Typically, the fundamental level describes the competency for a professional that requires some coaching and oversight, but is able to understand and identify basic concepts. The skilled level of the competency reflects the professional's solid understanding of the competency and use of the information to take action independently in most situations. The advanced level embodies high level thinking, problem solving, and the ability to guide others in the competency. The process for developing both the three levels and examples involved 5 workgroups, each chaired by a content expert and comprising of national/international clinical research experts, including representatives from research sites, professional associations, government, and industry and academic sponsors. **RESULTS/ANTICIPATED RESULTS:** The committee developed 51 specific competencies arrayed across 3 levels and examples of each to demonstrate an appropriate application of the competency. The competencies and examples, and potential utilization, will be described. **DISCUSSION/SIGNIFICANCE OF IMPACT:** The use of competencies in the context of workforce development and training initiatives is helping to create standards for the clinical research profession. These leveled competencies allow for an important refinement to the standards that can be used to enhance the quality and safety of the clinical research enterprise and guide workforce development.

2502

### The need for an evidence-based CTS specific IDP for early career training and for a long-term and sustainable career in clinical translational sciences

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**OBJECTIVES/SPECIFIC AIMS:** To establish a conceptual framework to develop a CTS-IDP with data analytics, and an e-Learning Faculty Development Guide on

best practices and use of the IDP over the CTS academic life-course. METHODS/STUDY POPULATION: To accomplish our goal, we propose the following methods: (1) an online survey, using a convenience sample of the 24 KL2 CTS Collaborative members (conducted in 2017), to assess perceived needs for a universal CTS-IDP, current IDP practices, barriers to IDP use, and to discern and align each CTS Hub's interests, expertise and commitment to specific areas of the study; (2) A scoping narrative literature review, utilizing the Arksey and O'Malley framework covering the time period corresponding to the initiation of funding (1999) of the original K30 Clinical Research Curriculum Awards through to the present CTS funding period, incorporating Medical Subject Heading (MeSH) keywords (career development; career development plan; employee plan; mentoring plans; compacts; research contracts; career planning; mentor guide), initially delineated by USC reference librarian and to be expanded by reference librarian services from the Icahn School of Medicine at Mount Sinai and University of Rochester, and performed on NIH searchable databases including NCBI PubMed, Central and Medline & Worldwide Science; Web of Science, ProQuest, ProQuest Abi/Inform, Google Scholar, Cochrane, Ovid MEDLINE databases, as well as Google for published papers in English and Spanish. For this portion of the work, we will describe and characterize (1) research career development or progression constructs, domains, and milestones; (2) establish the presence or absence of defined and/or pre-specified timed milestone objectives and inclusion of SWOT analytics (strengths, weaknesses, opportunities, and threats) and/or Gantt chart approaches; (3) delineate IDPs structure, toolkits and their key features (competencies, skills acquisition and processes utilized); (4) and identify specific gaps to best address the need for personalized career development education. Based on this review, we will synthesize CTS milestones, develop a time frame for meeting RCD expectations, and establish RCD benchmarks for achieving these milestones, all in consensus with the IDP Collaborative Workgroup. RESULTS/ANTICIPATED RESULTS: Seventy-seven percent of the IDP CTSAs responded to the online survey, led by University of Rochester, and the results can be summarized as follows: (1) 100% agreed that the IDP process is important and should be considerably improved to optimize effectiveness; (2) a range of diverse IDP formats are utilized, making comparisons across programs difficult; (3) 50% of CTSAs hubs report only fair to good compliance with the IDP process; (4) a major barrier to the IDP process is lack of instruction regarding how best to utilize; (5) poor alignment of currently available IDPs designed for basic science PhDs with CTS investigators; (6) an absence of a CTS specific IDP to best foster RCD for this specific career trajectory. When asked: What are the barriers to writing a detailed and thoughtful IDP, responses in order of agreement from greatest to least were: No verification of acquired competencies, beyond self-report (56%), Static platform (38%), Not constructed for clinical and translational researcher (31%), No analytical or documentation on use (31%), No instruction given to scholars on how to use it effectively and efficiently (31%), The IDP we are using is more constructed for PhD students and postdoctoral fellows (25%), No instruction given to the scholars on why it is important as adult learners (19%), and Not constructed for early career physicians/scientist (13%). Additional progress has been made on our Scoping review: An initial ABI/Inform and PubMed USC research librarian conducted search using Author names yielded 72 articles, of which only 2 were relevant to the topic at hand. A ProQuest™ search yielded 19 potentially relevant articles, 11 of which were of relevance to the topic of IDPs; and a Google Scholar search yielded 18 and 25 on career development and self-management, respectively. This has enabled us to put forth an initial model of factors that impact the purpose and design of IDPs that includes: DISCUSSION/SIGNIFICANCE OF IMPACT: Discussion: Our initial data suggests that many CTSAs institutions see the need to further enhance the mentoring process with a more informed and personalized IDP template and process. Furthermore, our initial scoping review suggests a framework upon which to build specific components of a more ideal and useful IDP to best guide mentored research career development of CTS trainees. Significance: Developing and evaluating collaborative evidence-based CTS IDP and corresponding e-Learning Guide could potentially prevent or reduce important delays in RCD, a common roadblock for the translation of clinical interventions. Ultimately, the CTS-IDP serves not only to support and frame a scholar's RCD "habits of mind" during training and early career development but to also to achieve a sustainable long-term career at a CTS researcher equipped to meet the ever challenging and dynamic research landscape.

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### TLI team approach to social and genetic determinants of nocturnal blood pressure

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OBJECTIVES/SPECIFIC AIMS: The TLI Team approach aims to train translational investigators capable of tackling complex and multifaceted diseases, such as hypertension, by beginning multidisciplinary, team-based training early in their graduate programs. METHODS/STUDY POPULATION: Leanne Dumeny is a

graduate student in Genetics and Genomics studying how pharmacogenomics can be applied to improve clinical care and cardiovascular outcomes. Chu Hsiao is a graduate student in Anthropology studying how sociocultural experiences become biologically embodied. Both are in the Ph.D. phase of M.D.-Ph.D. training. Joining the seemingly disparate but complementary fields of anthropology and genomics facilitates understanding of the intersection between socially driven experiences and genetics on nocturnal blood pressure. Understanding both social determinants, such as racial discrimination, and biological determinants, such as genetics, is important because an interplay of gene-environment interactions influences many complex diseases. Rarely can 1 individual, or 1 discipline, tackle all the perspectives necessary to answer these types of complex questions. The TLI Team curriculum teaches students to navigate the spectrum of translational research as a team, reflect on disciplinary limitations, and embrace collaborative research. RESULTS/ANTICIPATED RESULTS: This team project will investigate the relationship between racial discrimination and genetics using a large epidemiological cohort of African Americans in Mississippi. The data request application is currently under review. By the project's end, the team anticipates their investigation will reveal novel associations between racial discrimination, genetic polymorphisms, and nocturnal blood pressure measurements. The investigators will have gained experience obtaining and analyzing large external data sets, working in diverse team settings, collaborating across state-lines, and publishing articles. Through this team approach, the students will also understand the barriers to working in multidisciplinary groups, and develop a foundation for approaching future collaborations. DISCUSSION/SIGNIFICANCE OF IMPACT: By joining anthropology with genomics, it becomes possible to understand the intersection between socially driven experiences of racial discrimination and genetics on nocturnal blood pressure. The successful training of this first cohort of team-applicants to the TLI funding mechanism can impact how graduate education will be structured and could reframe graduate education to emphasize a team-based approach.

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### Training cycle in clinical and translational research (CTR) for undergraduate health sciences programs (HSUP) at University of Puerto Rico-Medical Sciences Campus (UPR-MSC) and Universidad Central del Caribe (UCC): Pathway for students and faculty

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OBJECTIVES/SPECIFIC AIMS: Responding to the need and interest of students and faculty of the UHSP in learning about CTR, the Title V Cooperative Project between UPR-MSC and UCC, developed and offered a training cycle (TC) in CTR. METHODS/STUDY POPULATION: Undergraduate students (US), undergraduate faculty (UF), and graduate students (GS) were invited to register in: Research Education Towards Opportunities (RETO) and Mentorship Offering Training Opportunities for Research (MOTOR), which consisted of 20 hours of training in CTR, with interdisciplinary sessions in: Introduction and preparation of a presentation in CTR; Identify, interview and share a presentation of a CT researcher; participation in conferences and a summer camp in CTR. At the end of the TC, surveys—satisfaction and needs assessment—for training in CTR were administered. RESULTS/ANTICIPATED RESULTS: Thirty-three (33) registered in the TC, distributed: 13 (39.39%) US in RETO, 12 (36.36%) GS and 8 (24.24%) UF in MOTOR. Of these, 25 (75.75%) answered and submitted the on-line surveys and received a completion certificate. All (100%) were satisfied with the TC, and for 96% of the respondents, their expectations were fulfilled, and will continue in the TC. They selected critical review, scientific communication, and cultural diversity as thematic areas of interest. In addition, 60% of them selected neuroscience, cancer and medical imaging as main research areas of interest. DISCUSSION/SIGNIFICANCE OF IMPACT: The TC demonstrated to be an effective strategy to provide new knowledge, experiences, and interest in CTR. It also established a pathway for future engagement in CTR.

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### Utilizing a reviewer database to facilitate integration of an investigator-focused translational research and career development program across the state of Indiana

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OBJECTIVES/SPECIFIC AIMS: The Indiana CTSI is investigating innovative approaches to integrate resources that will enrich scientific investigators. Our