implementation, suggesting the need for more agile methods. We present an evaluation of the World Health Organization's Emergency Care Toolkit implementation in Zambia using rapid qualitative methods to provide timely feedback. METHODS/STUDY POPULATION: We evaluated the implementation of the Emergency Care Toolkit in eight general and referral hospitals in Zambia in 2023 using a rapid-cycle, qualitative template analysis approach grounded in the Consolidated Framework for Implementation Research (CFIR). We gathered qualitative data from operational field notes, focus groups, and key informant interviews of administrators, clinicians, nurses, and support staff in all eight hospitals in Zambia. We parsimoniously applied CFIR constructs and tool-specific codes, focused on barriers and facilitators, to allow for rapid but comprehensive cross-case analysis. The results were used to generate a matrix of stakeholder-relevant, plain-language barriers and facilitators for each tool. RESULTS/ANTICIPATED RESULTS: We completed eight site visits with focus groups and interviews following initial implementation in September 2023 to gather firsthand knowledge related to implementation of the Toolkit. The CFIR-focused coding accelerated analysis by centering on barriers and facilitators for each tool while maintaining a comprehensive evaluation framework. Summary tables of barriers and facilitators were easily interpreted by lay stakeholders. Visualization in tables allowed for identification of common themes across tools and hospitals, making comprehensive recommendations to the implementation and dissemination process quickly possible. We anticipate the study findings will empower implementing partners to make timely, actionable improvements. DISCUSSION/SIGNIFICANCE: Rapid-cycle qualitative implementation evaluations allow for rigorous yet timely feedback on the implementation process compared to traditional methods. This efficient strategy is particularly important in resource-constrained environments where inefficient implementation wastes limited resources and create delays that cost lives.

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Automated PDMS Engraving and Assembly of a Prototype Microfluidic Artificial Lung*

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OBJECTIVES/GOALS: We report an automated manufacturing system, and a series of cylindrical multi-layer microfluidic artificial lungs manufactured with the system and tested for fluidic fidelity and function. METHODS/STUDY POPULATION: A Roll-to-Roll (R2R) system to engrave multiple-layer devices was assembled. A 100 um-thick silicone sheet passes through an embedded CO2 laser engraver, which creates patterns of any geometry on the surface. The sheet is plasma-activated to create an irreversible bond, and rerolled into a processed device. Unlike typical applications of R2R, this process is synchronized to achieve consistent radial positioning. This allows the fluidics in the device to be accessed without being unwrapped. The result is a cylindrical core surrounded by many layers of microfluidic channels that can be accessed through the side of the device or through fluidic vias. This core is cut to expose the microfluidic layers, and then installed into a housing which routes the fluids into their respective microfluidic flow paths. RESULTS/ANTICIPATED RESULTS: To demonstrate the capabilities of the R2R manufacturing system, this method was used to manufacture multi-layer microfluidic artificial lungs (μALs). Gas and blood flow channels are engraved in alternating layers and routed orthogonally. The close proximity of gas and blood separated by gas-permeable PDMS permits CO2 and O2 exchange. Three μALs were successfully manufactured. Their flow paths were visualized using dyed water and checked for leaks. Then they were evaluated using water for pressure drop and CO2 gas-exchange. The top performing device had 15 alternating blood and gas layers. Test with whole blood demonstrated oxygenation from venous (70%) saturation levels to arterial (95%) saturation levels at a flow rate of 3 ml/min. DISCUSSION/SIGNIFICANCE: The ability to cost-effectively produce high surface area microfluidic devices would bring many small-scale technologies from the realm of research to clinical and commercial applications. In particular, most microfluidic artificial lungs only have small rated flows due to a lack of manufacturing processes able to create high surface area devices.

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Using Opportunistic Sampling and Remnant Blood Samples to Develop Pediatric Pharmacokinetic Models to Inform Antidepressant Dosing

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OBJECTIVES/GOALS: Developing pharmacokinetic (PK) models to guide selective serotonin reuptake inhibitor (SSRI) dosing in youth is costly, time-intensive, and requires large numbers of participants. We evaluated the use of remnant blood samples from SSRI-treated youth and developed precision PK dosing strategies. METHODS/STUDY POPULATION: Following IRB approval, we used a clinical surveillance platform to identify patients with routine phlebotomy within 24 hours of escitalopram or sertraline dosing. Remnant blood samples were obtained from youth aged 5–18 years, escitalopram and sertraline concentrations were determined, and clinical characteristics (e.g., age, sex, weight, concomitant medications that inhibit sertraline or escitalopram metabolism) and phenotypes for CYP2C19, the predominant enzyme that metabolizes these SSRIs, were extracted from the electronic medical record (EMR). A population PK analysis of escitalopram and sertraline was performed using NONMEM. The influence of clinical variables, CYP2C19, and dosing was evaluated from simulated concentration-time curves. RESULTS/ANTICIPATED RESULTS: Over 21 months, we

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collected315 samples from escitalopram-treated patients (N=288) and 265 samples from sertraline-treated patients (N=255). In youth, escitalopram and sertraline exposure (concentrations over time) and specific pharmacokinetic parameters (e.g., clearance) were influenced by CYP2C19 phenotype, concomitant CYP2C19 inhibitors, and patient-specific characteristics. Escitalopram and sertraline concentrations from remnant blood samples were 3.98-fold higher and 3.23-fold higher, respectively, in poor metabolizers compared to normal metabolizers (escitalopram, $p<0.001$) and compared to normal, rapid, and ultrarapid metabolizers combined (sertraline, $p<0.001$). DISCUSSION/SIGNIFICANCE: Combining remnant blood sampling with pharmacogenetic-integrated EMR data can facilitate large-scale population PK analyses of escitalopram and sertraline in youth. This real-world approach can be used to rapidly develop precision SSRI dosing strategies, including slower titration and reduced target doses in CYP2C19 poor metabolizers.

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Investigations of Clinical and Translational Science Roadblocks: a Survey of a Private Medical School and a Large Public University

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OBJECTIVES/GOALS: Clinical and translational science needs to address roadblocks to translational processes. We conducted a survey at two institutions, a private medical school and a large public university, to understand the frequency and distribution of barriers and roadblocks to research. METHODS/STUDY POPULATION: We reviewed the literature to compile a pool of barriers and roadblocks and convened a panel of relevant stakeholders to develop a 20-item questionnaire. Survey respondents were asked to select and prioritize the five leading clinical and translational roadblocks, provide information regarding their academic degrees and rank/position, complete open-ended items regarding their areas of research, and optionally add additional remarks in a comment box. The survey was disseminated in August 2022 via REDCap to faculty and staff with active research protocols at Baylor College of Medicine and the University of Houston. RESULTS/ANTICIPATED RESULTS: In total, 227 respondents completed the survey. Their disciplines were basic science (29.5%), translational research (52.9%), clinical research (55.5%), community-engaged research (9.7%), and educational research (9.7%). Respondents identified 1) lack of access to trained research coordinators, 2) lack of understanding about different resources that facilitate research, 3) complex regulatory environment and delays, 4) fragmented infrastructure for administrative and fiscal processes, and 5) inadequate funding for pilot projects to foster new research. Other roadblocks included lack of established community stakeholder partnerships, inadequate access to medical record data, and limited biostatistical support. In the comments, several respondents noted that all items included were important. DISCUSSION/SIGNIFICANCE: Research workforce recruitment/training was the highest priority followed by lack of access to information and administrative bottlenecks. We are building an online portal to increase awareness and simplify access to competency-based training and research services. Initiatives are underway to address other roadblocks.

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Feasibility of a Home-based Physiotherapy Program to Increase Physical Activity Levels in Older Adults with Diabetes Mellitus

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OBJECTIVES/GOALS: The objective of this study is to assess the feasibility and preliminary impact of a physiotherapy protocol for developing an individualized home-based physical activity program to increase physical activity (PA) levels in sedentary older adults with Type II Diabetes Mellitus (T2DM) living in Puerto Rico (PR). METHODS/STUDY POPULATION: This will be a pilot study with two phases. In phase 1, we will design a novel patient-centered home-based PA program protocol for adults ≥65 years with T2DM based on the Information-Motivation-Behavioral Skills model. Its content validity will be assessed through focus groups with 10 experts and 10 older adults and analyzed using a directed content analysis. Phase 2 we will be program implementation using a one-group, repeated measures design with 12 adults ≥65 years with T2DM. PA levels will be assessed by recording active minutes with a Fitbit. Risk of falls, balance, strength, and physical function will be assessed through standardized tests validated for this population. Statistical analysis will include descriptive statistics, comparisons via chi-square/Fisher's exact test, and non-parametric tests. RESULTS/ANTICIPATED RESULTS: We expect to recruit a minimum of 12 participants and to administer the program for 12 weeks at a frequency of two visits per week. We anticipate that implementing and supervising the home-based PA protocol will be feasible as determined by recruitment and retention rates, patients' satisfaction, and compliance with the program. We also expect that this protocol will increase physical activity levels, improve general strength, balance, physical function, and reduce the risk of falls in sedentary older adults with T2DM. DISCUSSION/SIGNIFICANCE: As the third cause of death in PR, T2DM represents a public health challenge. An effective home-based PA program may decrease morbidity and mortality rates in older adults by increasing PA and functional health. This study will provide data for planning a randomized controlled trial to assess its effectiveness in the outcomes of interest.

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Two Newly Developed Frontiers CTSI Applications to Support Recruitment and Trial Management: The Frontiers Trial Finder Mobile App and a Predictive Accrual Web-based App

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OBJECTIVES/GOALS: Frontiers CTSI developed applications to ensure its science teams have technological tools to advance their community engagement and trial management. The Trial Finder app is a mobile application that allows users to navigate available trials. The Accrual app will help study teams monitor their

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