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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