

Background: In 2014, a working model of a medical device intended to rapidly determine temperature, respiratory rate, and heart rate in infants and children at risk for bacterial pneumonia was introduced to over 100 health care providers at 8 hospitals in Malawi. As part of this community based participatory design (CBPD) process, it was determined that this device could also be utilized for the assessment of newborns in need of resuscitation, and for longer term monitoring of vital signs in hospitals. Over the next year, the electronic component of this device was perfected and the exterior harness was envisioned to be capable of quickly capturing heart rate in neonatal patients.

Methods: The current design team has applied engineering principles to guarantee the safety and suitability for pediatric patients, practice green engineering guidelines to ensure durability and sustainability, and designed a model that both professionals and individuals with less intensive training can use effectively. Utilizing human factors design principles, the team has created a device that can be applied rapidly, adjusted to fit patients with a variety of physical morphologies and sizes, and does not irritate infant skin. The objective of the visual display is to provide essential information that permits the user to intervene as quickly as possible.

Findings: Biocompatible materials have been selected, reusable skin electrodes have been integrated, and a novel method for securing the device on the chest has been created. Radio frequency and electromagnetic safety testing is anticipated. The display for the user will be part of the device, and there is an option for wireless transmission of data for display on low cost handheld devices as well.

Interpretation: Through a CBPD process, an appropriate, affordable medical device will soon be ready for human testing in the US, and for follow up feedback in Malawi through the efforts of TEAM Malawi. This approach is expected to lead to a final product that meets the needs of the end user, at a cost that promotes sustainability.

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Abstract #: 2.050_HHR

Client Evaluation of Peer Counselor Performance in a Rural PMTCT Program in Nigeria

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Background: PMTCT service scale-up in Nigeria has been challenging, particularly in rural areas where professional health workforce is limited and uptake is low. Engaging experienced HIV+ women to serve as lay peer counselors (PCs) is important in optimizing outcomes among PMTCT clients. MoMent Nigeria is a two-arm implementation research study investigating the impact of a structured, supervised peer counselling program on PMTCT outcomes in rural areas. Client-focused audits of PC activities were conducted to evaluate PC performance and for Quality Control (QC).

Methods: PC audits were conducted in batches over an 18-month period, among PC clients who were HIV+ women at different stages of the PMTCT cascade. A structured 19-item interviewer-administered questionnaire was used to survey clients. Interviewees were randomly selected from among clients engaged with PCs for ≥ 3 months. Descriptive statistics, Chi square comparison of proportions and tests of association were applied to the data.

Findings: Of 497 study clients enrolled, 92 (18.5%) were interviewed: 59 (64.1%) from intervention (structured, high supervision PC program) and 33 (35.9%) from control (loosely structured, limited supervision PC program) sites. Median age of evaluators was 29 years and 93% were married with a median of 2 children; $\sim 70\%$ were breastfeeding mothers. Over a quarter (26.1%) of clients did not know their PC's HIV status, which did not differ between the intervention and control arms (23.7 vs 30.3%, $p=0.98$). Monthly median number of PC visits to client's home did not differ either [3 (1-4) vs 2 (0-4), $p=0.84$]; 6.8% vs 18.2% of intervention vs control women received no visits from their PCs, respectively ($p=0.42$). Overall, 81.6% of all PC clients interviewed rated their PC support services as "Very Good" or "Excellent," with no difference between the two arms.

Interpretation: Overall, PCs were well-received among rural PMTCT clients, however PC disclosure to clients appears to be suboptimal. Although not significant, the proportion of clients not visited was higher among less supervised PCs which may be due to less oversight. While PCs are well-received, increased supervision may be useful for better psychosocial support and outcomes.

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Disparities in Availability of Essential Medicines to Treat Non-communicable Diseases in Uganda: A Cross-sectional Poisson Analysis Using the 2013 Service Availability and Readiness Assessment

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Background: The most widely endorsed methodology used to collect data on health system readiness is the Service Availability and Readiness Assessment (SARA), a comprehensive survey of health facility preparedness, developed by the World Health Organization. SARA data have not previously been used to model and analyze the predictors of readiness indicators measured in the survey. We sought to demonstrate that SARA data can be used in this way by modeling the availability of essential medicines for treating non-communicable diseases (EM-NCD).

Methods: We built a Poisson regression model using data collected at 196 Ugandan health facilities in the 2013 SARA survey. Our outcome of interest was the number of different EM-NCD available in each facility. Basic amenities, basic equipment, region, health facility type, managing authority, capacity for diagnosing NCDs, and range of HIV services were used as predictor variables.

Findings: Adjusting for basic amenities, basic equipment, and capacity for diagnosing NCDs, our final model indicates significant associations between EM-NCD availability and geographic region, health facility type, managing authority, and range of HIV services. Adjusting for other variables such as facility type and amenities, private for-profit facilities' number of EM-NCD is 124% higher on average than public facilities ($p < .001$). General hospitals and referral health centers had 80.5% ($p = .017$) and 110% ($p = .006$) higher EM-NCD counts than the lowest level facilities, respectively. Facilities in the Northern and Eastern regions have significantly lower EM-NCD counts than those in the capital region ($p = 0.015$ and $p = 0.003$, respectively.) Offering HIV care and support services was associated with 35% lower average EM-NCD counts ($p = 0.006$), though offering HIV counseling and testing was associated with 57% higher counts of EM-NCD ($p = 0.048$).

Interpretation: By conducting the first Poisson analysis using SARA data, we have identified multiple disparities in the availability of EM-NCD in Uganda. Our findings can be used by health system planners and policymakers to guide the distribution of limited resources. While the primary purpose of SARA is to assess and monitor health services readiness rather than produce data for statistical analyses, we show that it can also be an important resource for answering more complex research and policy questions.

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Improvement in User Confidence and Competency in Novice Endoscopists with the Use of a Smartphone-based Endoscopy Training Application

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Program/Project Purpose: Global endoscopic capacity is limited by a lack of providers skilled in these relatively complex procedures. Endoscopy is useful in early detection and treatment of gastrointestinal cancers. With rising rates of gastrointestinal cancers, there is an urgent need for providers trained in the performance of endoscopy. Current methods of endoscopic training, based on an apprenticeship model, are inadequate to prepare trainees to meet advancing competency expectations.

Structure/Method/Design: We have developed an interactive smartphone-based endoscopy teaching application that focuses on endoscopic techniques and management of commonly encountered GI pathology. The goal is to create a central resource where clinicians can access information required to successfully perform endoscopy which adheres to the standards described by the major gastroenterology societies. The application can provide guidance (through demonstrative videos and verbal instruction) on the technical aspects of performing endoscopy; it also contains information about the cognitive aspects i.e. identifying and managing GI diseases. The application is currently being evaluated by a group of six first-year gastroenterology fellows at Baylor College of Medicine (Houston, TX) to determine feasibility of this novel training tool.

Outcome & Evaluation: We have conducted a “pre-test” survey with the study participants to assess user confidence and knowledge

regarding commonly encountered GI conditions. After four weeks of unlimited use of the application, we will conduct a “post-test” survey to examine these same areas of interest and also to obtain feedback regarding the application itself.

Going Forward: We plan to expand this tool to cover a wider range of pathology and to include other procedures such as colonoscopy. We envision that this tool can have important global health applications. Cell phones are increasingly utilized in underserved global regions - we hope to take advantage of this to provide a unique platform for delivery of education. Specifically, we will develop this tool so providers with varying levels of training (i.e. non-gastroenterology trained physicians and even nurses), practicing in low-resource settings, can receive detailed information on how to perform basic gastrointestinal procedures. Future aims would also include development of this tool for other, non-GI procedures that can be encountered in low-resource settings and also for patient-centered education to promote compliance and enhance public health efforts worldwide.

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Human-centered Strategic Planning at a Rural Rwandan Medical School: A Case Study for Navigating Institutional Challenges and Strengthening Community and National Population Health in Low and Middle Income Countries

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Program/Project Purpose: Human-centered design (HCD) for strategic planning of educational, infrastructural, and financial objectives can provide a framework for medical schools throughout LMICs to efficiently increase in-country healthcare providers while concurrently contributing to community and national healthcare priorities. We undertook an HCD strategic planning process for the University of Gitwe Faculty of Medicine and Allied Health Sciences in Gitwe, Rwanda, the first rural medical school in Rwanda, opened in 2013.

Structure/Method/Design: The HCD framework of “empathetic needs finding, definition of challenges, idea-generation, iterative prototyping, and testing-retesting of solutions” was employed. Needs finding through semi-structured interviews of patients, physicians, nurses, University of Gitwe and Teaching Hospital staff, educators, students, community leaders, water and electricity managers, architects, financial planners, and international partners were conducted. A 15-year phased model was proposed with priorities elaborated and debated in multiple sessions. An architecture advisor evaluated Rwandan and East African Community Teaching Hospital standards to assess “needs” for infrastructure versus existing conditions. Similarly, this was done for medical education facilities. Local epidemiology was analyzed against national health priorities. Financial planning considered current budgetary circumstances, capital projects, and student and faculty financial positions.