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and 30 family members and patients and interviews were conducted for 7 nurses and 6 family members during the summer of 2016.

Findings: Quantitatively, most patients had over two caretakers who spoke mainly Luganda, Swahili, and/or English. Feeding, medication monitoring and turning the patient to avoid bed sores were the most performed tasks by caretakers. The symptoms most caretakers were aware of included fever/high temperature, change in breathing and headaches/pain. Qualitatively, the main themes from the interview transcripts were the need for educational materials, ward space limitations that leads to overcrowding, barriers to patient care such as the limited number of nurses, medication management, and staff-caretaker relationships.

Interpretation: Our findings suggest that future interventions should focus on the use of educational materials like posters with pictures, pamphlets and possibly mobile technology (SMS) in Luganda, Swahili, and English for patient-family education in the MNRH neurosurgical ward. These materials should be highly informative on the main tasks required of caretakers such as feeding, medication management and reporting symptoms to hospital staff. There is also a critical need for fewer caretakers in the ward and for hospital staff to lead patient-family education efforts to assist family members in caring for the patients and improving their health outcomes.

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Abstract #: *2.018_HHR*

A Global Analysis of the Proportion of Surgical Specialists in Relation to Overall Human Resources for Health

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Background: Today, five billion people lack access to safe, affordable surgical and anesthesia care. A major reason for this is the pandemic shortage of surgical workforce. In 2015, the Lancet Commission on Global Surgery estimated that at least 20-40 surgeons, anesthesiologists, and obstetricians (SAO) are needed per 100,000 people. This is far from the case in many countries. However, in those countries, there is often also a general lack of physicians and overall health workforce, but thus far, there are no studies on the relationship between the number of specialist SAO and the total physicians and health workforce, and its impact on health outcomes. Our aim is therefore to address this gap.

Methods: In this ongoing study, we use available national level data to calculate the ratio of total SAO to physicians (SAO/physician ratio, in %) for each country with available data. We then investigate the association between the SAO/physician ratio to national health expenditure and gross national income per capita in US$, maternal mortality ratio per 100,000 (MMR), number of surgical procedures, number of cesarean sections, number of non-physician health workers, and number of medical graduates. We use univariate and multivariate regression analysis. Data sources include published reports, the World Bank, WHO, and OECD databases.

Findings: We calculated the SAO/physician ratio for 148 countries with available data. The SAO/physician ratio ranged from 0.1% in Afghanistan to 71.6% in Bolivia with a median of 17.5% (interquartile range 10.4%—26.5%) globally. Generally, a higher SAO/physician ratio was associated with a higher MMR. Some countries, such as Qatar and Bosnia and Herzegovina, however, have low MMR despite a low SAO/physician ratio. The association between the SAO/physician ratio and additional variables remains to be assessed.

Interpretation: In this ongoing study, preliminary results indicate inverse correlation of the SAO/physician ratio to MMR. Next steps include a full assessment of all selected variables, as well as assessment of the cadres of surgeons, anesthesiologists, and obstetricians separately. Assessing the variation in proportion of SAO to total physician workforce will contribute to an improved understanding of the role of surgery in health systems worldwide.

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Abstract #: *2.019_HHR*

Training Healthcare Workers on the Use of Electronic Medical Records in HIV clinics in Kenya: An Evaluation of Three Training Models

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Background: There is substantial evidence that use of electronic medical records (EMR) can improve the quality of health services and mitigate the overburdening of healthcare workers, yet a number of recent studies have identified inadequate training in health informatics as a persistent barrier to the implementation of EMR in low-resource settings. From September 2012 to September 2014, The International Training and Education Center for Health (I-TECH) trained 1,423 Kenyan healthcare workers in Western Kenya on the use of EMR for point-of-care data entry and clinical decision-making using three distinct training models.

Methods: The study is a quantitative program evaluation of the three training models comparing cost, geographic coverage, and quality of training, as measured by pre- and post-tests administered before and after the trainings. Paired t-tests were conducted to examine the changes in score from pre-test to post-test within periods, and multiple linear regression was used to examine the associations between mean post-test scores variable by the training models and adjusted for pre-test score, age, sex, province, and cadre. Test questions were also divided into categories based on adult learning theory, including *Knowledge*, *Computer Skills*, and *Attitudes* towards EMR systems.

Findings: Cost differed by training model, with a substantial reduction in cost per trainee when the three-day, on-site model was administered. For the quality outcome, pre-test scores differed by training model, age, and gender, with females scoring lower than males on the pre-test in all categories. There was no statistically significant difference in total mean change scores by training model. However, these scores were primarily composed of the Knowledge Category. When the Computer Skills Category was evaluated separately, the three-day training models showed statistically significant ($p<0.001$) learning loss when compared to a five-day training model.

Interpretation: The three-day, on-site model was the least expensive, and quality of training, as measured by pre- and post-test scores, did not differ by training model. Shorter trainings are associated with

learning loss in computer skills. The trainings appear to particularly effective for Nurses, who had the highest mean change scores ($p<0.001$) in comparison with other cadres in all models.

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Abstract #: *2.020_HHR*

The Fifth Child – A Data Informed Community Engagement Strategy to Improve Defaulter Tracing on Immunizations

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Program/Project Purpose: Access to health care is low in rural Northern Uganda, and low rates of vaccination reflect this issue of access. Only 49% of children are fully vaccinated in this area by 23 months of age. The International Rescue Committee, in coordination with the Ugandan Ministry of Health, evaluated an mHealth application and community engagement strategy entitled CommCare+ to identify immunization defaulters and re-enter them into the vaccine schedule.

Structure/Method/Design: Control and intervention areas were selected for implementation of CommCare+, and the intervention area received the intervention from August 2015 until April 2016. At the end of the intervention period, a two-stage cluster survey was conducted in two arms using proportional-to-size and simple random sampling. Caretakers of children aged 12-23 months were interviewed about their children's vaccination status and barriers to vaccination. Additional data were collected from government-issued vaccination cards to determine vaccination status. A total of 683 children were included in analysis.

Outcome & Evaluation: Children in the control group were significantly more likely to have missed one or more vaccinations than children in the intervention group (51.7% vs. 39.6%, *p=0.001)*. However there was no significant difference in coverage of the DPT3 vaccine (*p=0.78)* or other individual vaccines. Regarding barriers to coverage, caretakers in both groups cited problems at the clinic as the biggest barrier to vaccination (26.1% vs. 27.3%, *p=0.10*). In each group, less than half of the caretakers of children who had missed on or more vaccinations were aware that their child was missing a vaccination (43.5% vs. 30.4%, *p=0.06)*.

Going Forward: The evaluation showed that children who were part of the Commcare+ approach were significantly less likely to have defaulted on at least one vaccination. The absence of a difference in individual vaccine coverage between the groups indicates that defaulting is not tied to one particular vaccine, but that coverage is spotty across the vaccine schedule. Caretaker knowledge of vaccination status appears to be a large barrier to complete vaccination as do problems encountered at the clinic. The findings support rollout of Commcare+ at a larger scale with close monitoring of measurable outcomes.

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Abstract #: *2.021_HHR*

Blended Learning on Family Planning Policy Requirements: Key Findings and Implications from a Mixed Methods Study

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Background: To address unmet needs for family planning and advance women's rights, U.S. federal foreign aid recipients must ensure compliance with the family planning legislative and policy requirements. Because many health providers work in rural and remote settings, blended learning, which combines in-person and online experiences, is a promising approach for strengthening their compliance knowledge. However, there has been no systematic study of the relationship between various learning approaches and their impact on learning outcomes within this context.

Methods: We conducted a mixed methods study to examine the effect of blended learning that included three components (online course, in-person training, and conference call) on the retention and application of family planning compliance knowledge. Learners were grouped into five categories—those who took: 1) the online course only once, 2) the online course more than once, 3) the online course plus the in-person training, 4) the online course plus the conference call, and 5) the online course, in-person training and the conference call. A total of 660 learners from 44 countries completed the online survey, of which 26 respondents participated in an in-depth interview. Study participants were asked about their knowledge of family planning compliance, use of knowledge gained, and suggestions to improve their learning experiences.

Findings: Knowledge retention was higher in the group that utilized all three learning approaches compared to the online course plus the conference call group ($p<0.05$). Learners who took the online course multiple times tended to retain knowledge better than respondents who took it only once, although this result was not statistically significant. Learners who had opportunities to attend the in-person training and/or the conference call were more likely to report that they had used the knowledge gained compared with those who took only the online course ($p<0.001$). Knowledge use was higher in the group that took the online course multiple times compared to the group that only took it once ($p<0.05$).

Interpretation: Blended learning having all three learning approaches resulted in the highest gains in knowledge and the highest level of knowledge use, suggesting that global health agencies continue using blended learning in their family planning compliance training.

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Global Health - The Lessons of Ebola: Two Universities Join to Teach an International Audience Via an Inter-professional Massive Open Online Course (MOOC)

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