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Program/Project Purpose: The lack of properly trained health care professionals in resource-limited settings has become a key constraint to the targeted completion of the UN's Millennium Development Goals. At the same time, the use of low-cost technological devices to disseminate educational information across the developing world is becoming increasingly common. The purpose of this study was to assess the feasibility and impact of using a low-cost Android tablet called connecTAB, to deliver clinical skills training to third-year medical students in Kenya via demonstrational videos.
Structure/Method/Design: The tablet was designed and manufactured specifically for areas with low bandwidth and was extremely low cost ($50 per tablet). Instructional video tutorials demonstrating clinical examination techniques of the cardiovascular and abdominal examination were pre-loaded onto the tablet. 51 3rd year medical students from Maseno University, Kenya, were subjects in the study. Students volunteered to participate in the program in response to an email solicitation from the school's administration sent to the entire student body. Students were informed that participation was voluntary and that they would be required to complete a pre and post-study questionnaire, as well as a pre and post-study clinical assessment. Students were also notified that they would be randomly allocated to either the intervention group or the control group. 25 students were assigned to the intervention group and 26 to the control group. At the start of the study, students from both groups completed an Observed Structured Clinical Examination (OSCE) of a cardiovascular and abdominal examination. Students who were allocated to the intervention group then received the connecTAB, whereas students in the control group did not. After a period of three weeks students from both groups completed a post-study OSCE for both the cardiovascular and abdominal evaluations and at the conclusion of the study students in both the control and intervention group received a connecTAB. To ensure the project remains sustainable students paid a nominal fee for the tablet.
Outcomes & Evaluation: There were significant improvements in score for both cardiovascular and abdominal examinations ($p < 0.001$), within the group who received the connecTAB when compared to the control group.
Going Forward: The potential of the connecTAB program, utilizing affordable technology equipped with open access videos, should be explored further in different contexts such as post-graduate training of doctors, and with populations such as nurses and community healthcare workers. It would also be useful to assess the long term retention of clinical skills. If connecTAB proves effective in these other environments, then it may well be worth scaling up the project to other resource-deficient parts of the world.
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Abstract #: *01ITIS025*

International comparison of smartphone use by resident physicians

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Background: In the US, clinical use of smartphones has increased dramatically over the last decade. Little is known about current patterns of use and use internationally. Residents are often early adapters of technology. The purpose of our study was to better understand the use of smartphones by residents in two partnering international sites and compare with use in our own clinical sites.
Methods: Our survey was designed to capture demographics and smartphone ownership, as well as patterns, perceived barriers and benefits of use. The survey was piloted in fall 2013 and after IRB approval was distributed in spring 2014 to a convenience sample of residents in the US (at the University of Utah and Brigham and Women's Hospital, Boston, MA), Universidad de Antioquia in Medellin, Colombia, and Hainan Medical University in Hainan, China. Participation in the survey was voluntary. Chi-Square and Kruskal-Wallis tests were performed to identify significant differences between groups.
Findings: A total of 444 residents responded to the survey, 273 (61%) from the two US sites, 35 (8%) from Colombia and 136 (31%) from China. The majority of respondents owned a smartphone (90% of Chinese, 94% of Colombians, 97% of Americans). Fewer Chinese residents used smartphones in the clinical setting (81%), when compared to Colombians (97%) and US residents (98%). In addition, reported amount of use was significantly less in the Chinese sites ($p < 0.0001$). In the US and Colombian sites, the top three smartphone uses reported were e-mail, internet access and texting between team members; whereas in the Chinese site the most frequent uses were internet access, calendar and medication formularies. The least used function in all three countries was physician order entry. Overall, use of smartphone functions was significantly different between countries ($p < 0.0001$). The overwhelming majority of respondents reported they felt smartphone use improved clinical care (94% in the US sites, 97% in both the Colombian and Chinese sites). Prior education in smartphone use was low in all countries (19% in US, 14% in Colombia and 17% in China). Significantly more respondents in Colombia and China desired additional training opportunities (88% in Colombia, 86% in China, 51% in US).
Interpretation: We describe the utilization of smartphones at two US institutions and partnering international sites in Colombia and China. While smartphones are ubiquitous in clinical care, use varies by country. Interestingly, despite differences in use almost all respondents feel that smartphones improve clinical care. Also, international respondents requested more learning opportunities. Our results are limited by the convenience sample and survey design. Despite these limitations, the high rates of smartphone use and interest in smartphone education described in this study suggest a high demand for smartphone education.
Funding: No external funding source.
Abstract #: *01ITIS026*

Facility mapping: A tool for effective planning for MNCH services

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Background: Improving outcomes in maternal, newborn and child health (MNCH) depends substantially on improving the

coverage and quality of critical interventions. A key constraint in many low resource settings is the lack of available health facilities capable of delivering critical MNCH interventions, leading to large investments in expanding physical infrastructure and human resources. Efficient allocation of resources requires information about the existing availability of services and key gaps in service configuration. However, this information is not often available. The University of Manitoba's Centre for Global Public Health is implementing a Technical Support Unit embedded within the Government of Uttar Pradesh (GoUP) to provide support for the planning and implementation of MNCH programs under the National Health Mission. There is a specific focus on 25 high priority districts (population approximately 60 million), which contribute disproportionately to maternal, neonatal and infant mortality. To improve the GoUP's planning and scale-up of the availability of MNCH services, we mapped facilities in the public and private sectors to assess availability, identify gaps and develop a planning roadmap for efficiently increasing service availability through the National Health Mission.

Methods: We conducted a rapid, large scale mapping and assessment of health facilities in the public and private sectors in 25 high priority districts of Uttar Pradesh in India. The mapping tools were designed to capture details of population, physical infrastructure, staff, drugs, equipment, supplies, services (antenatal care, delivery, postpartum, postnatal, abortion, newborn and child health), certain service statistics and use of facilities' untied funds. The mapping occurred over a three month period and covered a total of 7,560 public facilities (90% response rate) and 1,150 private facilities (63% of those identified as providing delivery care). Consent was obtained from the primary respondents at the facilities.

Findings: The mapping found that only 44% of an estimated 429,315 deliveries occurred in public facilities (39%) or identified private facilities (5%). The large majority of deliveries in public facilities occurred in block (sub-district) level facilities (52%) or district hospitals (15%). There were large gaps in the availability of delivery points, general infrastructure, human resources, equipment, drugs and supplies in the public sector at all levels of care, with large disparities between and within the 25 districts.

Interpretation: Facility mapping data were used to develop a strategic plan to expand service delivery points across the state and within each district, through a mix of enhancing the signal functions of existing facilities and activating dormant delivery points. This planning was incorporated into the National Health Mission project implementation plans at the district and state levels, and these plans are being tracked through ongoing assessments of the expansion of service availability.

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Abstract #: *01ITIS027*

The innovations initiative: Technological approaches for addressing maternal, newborn and child health

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Program/Project Purpose: As the use of technologies in public health becomes increasingly acceptable and feasible, it is essential that their application reflects the needs of specific target populations and incorporates multidisciplinary approaches. Innovations for Maternal, Newborn & Child Health (MNCH), running from 2009 to 2016 in five countries in Sub-Saharan Africa and South Asia, is a novel initiative that tests creative solutions to understand and overcome barriers to MNCH services. Two projects, Health Center by Phone (CCPF) in Malawi and Care Community Hub (CCH) in Ghana, exemplify the potential of mobile health technologies (mHealth) to address obstacles to health service access and delivery. We will present the findings and scalability of CCPF and the design and potential of CCH.

Structure/Method/Design: CCPF, recently completed, consisted of a facility-based toll-free hotline and text message reminders to connect women, caretakers and children to health workers via mobile phones. The intervention targeted a catchment population of four health centers in the Balaka region of Malawi, providing 35,000 pregnant women and 25,000 children access to the services. CCH, recently launched, aims to improve motivation, job satisfaction and professional development among frontline health workers through a mobile application. The intervention districts were selected based on collaboration with the Ghana Health Service and the Grameen Foundation to incorporate the CCH in the contexts of their current programs. All health workers in the selected districts were enrolled.

Outcomes & Evaluation: A positive effect of CCPF was observed on aggregate home-based care practices for MNCH and facility-based care for mothers. There was a negative effect on aggregate facility-based care for children, resulting from a substantial reduction in visits for fever, thereby reducing facilities' burden for symptoms that could be treated at home. CCH employed a human-centered design whereby the targeted end-users developed the content of the mobile application. It includes six concepts to support nurses to develop professionally, provide quality care, connect with others, manage work, improve well-being and feel appreciated.

Going Forward: The Innovations approach, illustrated through these pilots, provides invaluable insight for implementers and policymakers on mHealth to improve the quality of MNCH delivery and outcomes. CCPF has demonstrated that mHealth can work to improve MNCH even in low resource settings. CCH has highlighted the importance of context, community ownership and capacity in the design of technological interventions and their sustainability.

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Abstract #: *01ITIS028*

Genotyping malaria parasites to understand malaria transmission

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Background: Despite decades of control efforts, malaria remains a global burden, with more than 600,000 deaths annually, and more than half of the world's population at risk for infection. The renaissance of genomic research has offered public health programs new opportunities to better address malaria elimination and eradication. Current efforts call for identification of specific epidemiological break points, for which genetic analysis can offer more specific guidance about the status of the parasite population in response to control efforts. Genetic tools for elimination allow sensitive identification of malaria reservoirs and hotspots even among populations with asymptomatic disease. These tools can also track the emergence and spread of drug resistance in response to selection pressures. Furthermore, these strategies can be used to identify and track individual malaria parasites. These approaches are most useful