

participatory innovation to improve global health. Nearly all equipment available at participating hospitals required electricity to function; however, 56% of clinical staff reported experiencing power outages two or more times per week, rendering electricity-dependent technology useless. Many clinical staff expressed frustration regarding inability to prevent mortality attributed to equipment failure. Over 56% of clinical staff reported average time to repair a single piece of medical equipment as longer than six months. Reported barriers to repairing medical equipment included shortage of maintenance personnel (77.8%), lack of replacement parts (64.7%), lack of proper tools (61.1%), and lack of user's manuals for equipment (53%).

Interpretation: Health and technical education efforts should be intensively explored to increase working knowledge of medical device maintenance in LMIC. This study demonstrates that medical device donations fail to sustainably improve health outcomes, and technology innovation in global health should incorporate community expertise and local resources.

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Abstract #: 2.036_TEC

Improving access to safe surgical care by collaboratively developing a low-cost, ultraportable device platform: pilot trial results

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Background: We organized a tri-institutional, interdisciplinary collaboration to develop, evaluate, and deploy a new technology to help increase access to safe surgery. We reduced to practice a novel paradigm of surgical sterility in austere settings: that the space that determines patient outcomes—and thus warrants regulation—is not the operating theater, but the incision site.

Methods: We engaged in iterative and parallel prototyping with multi-stakeholder input to produce a low-cost, ultraportable, modular system. This comprises sterile, disposable clear drapes covering the incision, with arm and material ports. The drapes attach to a reusable frame with a battery-powered system supplying filtered air to control enclosure conditions. The entire system collapses to fit into small spaces such as duffels or unmanned aerial vehicles. We used an optical particle counter on a test mannequin torso to benchmark the device's ability to maintain the sterile field in a passively contaminated environment and when stressed with talcum puffs outside each wall. Particle counts were tested with active airflow and different port configurations (no port, materials port, materials and arm port) over 10 minutes at points along a simulated laparotomy incision and at the flanks.

Findings: Without airflow, the system reduced particle counts by 22.8% (20.0–25.6%) between the outside and inside five minutes after nonsterile setup. Talcum puffs increased external particle concentration by 28.3% but did not significantly change the internal particle count. Active airflow produced 0 particle count in 83.8 seconds (73.4–94.1 seconds). Low airflow was required to maintain 0 particle count.

Interpretation: Analysis of results recognizes limitations of using particle counts for dynamic approximation of microbiological burden. Successive ergonomic, optical, and mechanical testing generated an easy-to-use, ultraportable system capable of being customized via modules for different procedures. The system provides an effective passive barrier to active external contamination. In all port configurations, initially-contaminated enclosed air was fully purged of detectable particles within two minutes. Ongoing work includes reducing airflow requirement, obtaining microbiological data, reducing system cost, and assessing in vivo outcomes such as surgical site infection rates.

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From global to local: Virtual environments for global-public health education

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Project Purpose: Recent events such as the devastating earthquakes in Nepal, outbreaks of deadly infections like MERS and Ebola, and ongoing violent unrest around the world, are reminders that while even the most experienced travelers must prepare for the unexpected, the same dangers can also occur at home. Globalization has increased the overlap between global and local public health. However, it may be difficult to show learners who have never travelled internationally how similar the social, environmental, and economic determinants of health are for U.S. and international populations.

Virtual environments are online computer-generated simulations, in which users can be in different locations, but have real-time interaction in the same 3D space. These environments are accessed through a computer using a 3D viewer application. They can be used to present educational material in context and bring together learners in geographically separated locations.

The Aims of the Project Were: 1) To improve preparation for international global health (GH) electives through virtual experiences; and 2) To increase knowledge of the social determinants of health in both local and global settings in both GH and non-GH learners.

Design: Africa Traveler, with environments representing African settings, developed in 2013; and SPH Places, an urban and suburban U.S. neighborhood, developed in 2014; were piloted with health professional students and individuals without a health-care background. Using Kolb's theory of experiential learning as

a basis, learning objectives and structured interactions with programmed characters and objects within the environment enable individual and group learning to achieve educational goals. The environments were developed and deployed on open simulator, an open source virtual platform allowing for low development cost and sustainable use.

Outcome & Evaluation: To date, the environments have been used by over 50 learners. The program has been evaluated through review of learner feedback.

Going Forward: A formal evaluation of the educational impact of the program and development of environments representing additional international sites is planned.

Funding: SPH places was supported by the Training in Primary Care Medicine-Interdisciplinary and Inter-professional Graduate Joint Degree Program HRSA T85HP25092.

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Expanding access to evidence-based medicine to physicians and medical students in resource-poor settings to improve medical education

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Project Purpose: UpToDate, an evidence-based, expert physician-authored clinical decision support tool is used extensively in the United States and other regions of the world. UpToDate usage is linked to lower mortality and length of stay in U.S. hospitals. Despite its proven benefits, UpToDate usage in low-resource regions has lagged, due in part to subscription fees. We launched two programs to provide free access to UpToDate to physicians and medical students in these settings and to study its usage and impact.

Design: To expand access, we invited qualified physicians who provide care in a resource-poor context to apply for one-year free subscriptions to UpToDate. We also established collaborations with four leading African medical universities in Tanzania, Rwanda, Malawi, and Uganda to provide free five-year subscriptions to UpToDate to all medical students and faculty (n = approximately 6,000). To study UpToDate's impact on medical education, we are conducting a prospective observational cohort study. We will track usage patterns of UpToDate and the educational performance (examination scores) of medical students to understand the impact on medical education.

Outcome & Evaluation: We evaluated the provision of access to physicians by analysing their usage patterns. Since 2009, over

1,500 individual physicians and healthcare institutions have received free access to UpToDate through our program. During 2013-2014, 449 active users logged into UpToDate approximately 150,000 times. 61% of users logged in at least weekly. Users from Africa were responsible for 54% of the usage. Specifically, users from Rwanda accounted for 19%, from Tanzania for 5%, from Uganda for 2%, and from Malawi for 1%. Search patterns reflected local epidemiology with "Clinical manifestations of malaria" as the top search in Africa, and "Management of Hepatitis B" the top search in Asia. Evaluation of access to medical students is ongoing. So far, we have conducted focus groups with 29 faculty members and 99 medical students in two universities in Tanzania and Rwanda.

Going Forward: If we demonstrate a positive impact of UpToDate on medical education, we intend to expand our efforts to other universities in resource-poor settings.

Funding: UpToDate subscriptions for physicians and medical students were donated by Wolters Kluwer.

Abstract #: 2.039_TEC

Armenia's road to eHealth: Causative impact on eHealth literacy via gaps in post-soviet Armenia's digital divide

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Background: Although Internet use in Armenia has increased from 4%-28.7% from 2004-2011 it is unclear what gaps currently exist in the Republic of Armenia's digital divide (Pearce et al., 2013). The objective of this study was to assess and examine eHealth literacy in relationship to s between level of education level, urbanization, obesity, age, economic status, and Internet digital use and eHealth literacy.

Methods: In collaboration with Armenia's Ministry of Health, an IRB approved (00082410) cross-sectional study was conducted in five provinces in Armenia, to assess and examine eHealth literacy in relationship to level of education, urbanization, age, economic status, and Internet use. SAS statistical software analyzed the standard descriptive statistics as well as associations among continuous and categorical variables. The eHealth Literacy Scale (eHEALS) was used to assess participant's perceived skill using information technology for health purposes (Norman et al., 2006).

Findings: 517 participants (15.58% male; 84.42% female) ages 18 to 89 (mean age 47.25) were recruited using convenience sampling from clinics recommended by Armenia's Ministry of Health. 69.49% of those surveyed lived in cities, 77.7% lived below the poverty line, and 29.72% had university/college education. While 89.8% and 22.75% reported owning a cellphone and smartphone respectively, 25.35% didn't have access to the Internet. 27.6% accessed the Internet with their cell/smartphones and 32.7% used cell/smartphones to send receive text messages. 42.28% of all those who had Internet at home were 35-54 years old (p = .0004). Age (p < .0001), education (p < .0001) and financial status (p < .0001) were significant determinants for access to the Internet. There was significant difference in education level (p < .0001), income level (p < .0001), foreign language