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-depend-ent 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.

**Funding:** None.

**Abstract #: 2.036_TEC**

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

D.L. Teodorescu1, 2, D. Nagle1, J.F. Gómez-Márquez1, A.K. Young1, C.A. Iyasere3, 5, M. Hickman1, D.R. King2, 6, 7; 1MIT D-Lab, Cambridge, MA, USA, 2Harvard Medical School, Boston, MA, USA, 3MIT Little Devices Lab, Cambridge, MA, USA, 4Massachusetts General Hospital Department of Medicine, Boston, MA, USA, 5Massachusetts General Hospital Innovation Task Force, Boston, MA, USA, 6Massachusetts General Hospital Knight Surgical Research Laboratory, Boston, MA, USA

**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.

**Funding:** This project was supported by grants from the Harvard Scholars in Medicine Office (2012, 2015).

**Abstract #: 2.037_TEC**

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

R. Umoren1, E. Gossett2, E. Comaroski2, N. Rybak1, M. Johnson1, J. James2, 1University of Washington, Seattle, WA, USA, 2Indiana University Northwest, Gary, IN, USA, 3Wizardry and Steamworks, UK, 4Indiana University East, Richmond, IN, USA, 5Indiana University-Purdue University, Indianapolis, IN, USA

**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 traveled internationally how similar the social, environmental, and economic determinants of health are for U.S. and international populations.

Virtual environments are online computer-generated simula-tions, 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 pro-
grammed 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 addi-
tional 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.

Abstract #: 2.038_TEC

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

Y.K. Valris1,2, K. Wachte1,2, R. Chanda3, F. Masbili1, R. Kisenge3,
T. Walker4, N. Kennedy5, S. Malin6, S. Bhandari1, M. Teichman1,
E. Barron1, D. Gilpin1, P. Bonis1, R. Weintraub1,2,8; 1Harvard
Medical School, Boston, MA, USA, 2Global Health Delivery Project at
Harvard University, Cambridge, MA, USA, 3Muhimbili University of
Health and Allied Sciences, Dar es Salaam, Tanzania, 4College of
Medicine and Health Sciences, University of Rwanda, Butaro, Rwanda,
5College of Medicine, University of Malawi, Blantyre, Malawi, 6Mhara
University of Science and Technology, Mbarara, Uganda, 7Wolters Kluwer, Waltham, MA, USA, 8Brigham and Women’s
Hospital, Boston, Boston, MA, USA

Project Purpose: UpToDate, an evidence-based, expert physician-
authorized clinical decision support tool is used extensively in the
United States and other regions of the world. UpToDate usage is
linked to lowered 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

H.Z. Wright, S.R. Wright, C.D. Osborn, C.R. Tak

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 between level of education level,
urbanization, obesity, age, economic status, and Internet digital use
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 stan-
dard 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 educa-
tion. 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
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 educa-
tion level (p < .0001), income level (p < .0001), foreign language