

disease attributable to trauma. Emergency care is a high-impact and cost-effective form of secondary prevention. In response, the World Health Organization (WHO, 2005), the World Bank (2007), and the African Federation for Emergency Medicine (AFEM, 2013) have advocated integrating pre- and in-hospital phases of trauma care to strengthen the trauma “chain of survival.” Experts reports that integrated care systems may reduce the burden of disease from trauma, but their prevalence in SSA remains unreported. The primary objective of this study is to determine the prevalence of complete trauma care systems in SSA, and secondarily, where incomplete trauma care systems exist, to categorize and describe those components.

**Structure/Method/Design:** Three investigators separately conducted a comprehensive review of published and “gray” literature using combinations of search terms, including “trauma, injury, trauma care, system, acute, emergency, emergency medical services, prehospital, road traffic injury, sub-Saharan, Africa.” Other inclusion criteria included publication year (2000-2013), and relevance to emergency and health care systems. Articles were categorized by country and by phase of pre- and in-hospital emergency care.

**Results (Scientific Abstract)/Collaborative Partners (Programmatic Abstract):** 154 and 32 reports from the published and gray literature, respectively, satisfied the inclusion criteria. Five distinct phases of care emerged from the literature review: system activation, first-responder care, formal prehospital care, emergency transportation, and facility-based emergency/definitive care. Of 47 World Bank LMICs in sub-Saharan Africa, only one country, South Africa, reported the existence of trauma care systems with all five phases of care. The literature indicated the existence of fragmented, functional components or phases of trauma care systems in several countries, including Botswana, Ethiopia, Ghana, Nigeria, Kenya, Mauritius, Rwanda, Tanzania, Uganda, and Zambia. Examples of the phases identified include system activation (SMS text messaging, public transport vouchers, centralized toll-free access numbers), first-responder care (organized and informal community-based volunteers), prehospital care/transport (two-wheel, three-wheel, and four-wheel ambulances, air ambulances), in-hospital emergency/definitive care systems (accident and emergency centers/units).

**Summary/Conclusion:** Our review identified five distinct phases of trauma care operational in various systems across SSA. If meaningfully integrated in a locally appropriate manner, they could comprise an African trauma chain of survival. South Africa was the only country with all five functional and integrated components. Further advocacy and development for integrated trauma care systems are needed across SSA to help relieve the burden of disease from trauma.

### The wooden skull: An innovation through use of local materials and technology to promote the teaching and learning of human anatomy

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**Background:** The increasing numbers of medical institutions and medical professional students is a global reality which positively addresses Medical Education Partnership Initiative [MEPI] theme 1 [Increasing quantity and quality of health professionals] and more globally supporting the Mellenium Development Goals [4,5,6]. This, however, attracts major challenges particularly the facilitation of the teaching and learning processes which must deliver desired outputs like student centredness, more activity at the classroom level, and individualization among others [Harden RM & Laidlaw JM, 2012].

At present, large classes at medical institutions justify innovations like fabrication and utilization of wooden skeletal models as a sustainable mechanism in solving the problem of scarce and ethically restricted human teaching models.

**Structure/Method/Design:** Wood pieces [50-cm length and 20-cm diameter] were cut from a Jacaranda mimosifolia tree and prepared for the carving process. Six wooden models of human skull were fabricated by three wood carvists under guidance of one medical illustrator and three human anatomists. Two experimental groups of randomly selected biomedical science students [60 active and 60 control] were separately taught using wooden and natural skull models respectively and comparatively assessed using the standard natural skull specimen. The assessment used the standard traditional written, practical, and oral medical exams about the anatomy of the human skull.

**Results (Scientific Abstract)/Collaborative Partners (Programmatic Abstract):**

1. Six wooden skull models were produced and used for the experimental study with biomedical science students

2. The analyzed comparative scores between the active and the control groups showed no significant difference [ $P \geq 0.05$ ]

3. More than 90% of the active group participants strongly approved the validity and reliability of the wooden skull model. some of the statements of approval were:

“The model has almost 95% of all features which are prominently clear thus can be ably used for learning” [Muramagi Nathan, MBChB 2.2, BMS/0299/113/DU]

“I find the carved skull easy to study and learn” [Kiggundu Paul, MBChB, 2.1, BMS/0003/113/DU]

“All major features are visible and easily identified, therefore can be used for study purposes” [Kabatabaazi M, MBChB 2.1, BMS/0024/113/DU]

“With this model every 2 or 3 students should have a model available for practice” [Sr.M.Evelyn N, MBChB,2.1, BMS/0252/113/DU]

**Summary/Conclusion:** The wooden skull model can perfectly be used to facilitate teaching and learning of the anatomy of the human skull

### Defining the clinical role of adapted digital light field photography as a point-of-care tool in the treatment of Kaposi's sarcoma

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**Background:** In Mozambique, HIV-induced Kaposi's sarcoma (KS) is the most frequent form of malignancy seen at the Maputo Central Hospital (MCH). Point-of-care diagnostic tools are currently not employed in the treatment and monitoring of these patients; the efficacy of KS treatment is currently monitored visually and documented with written qualitative descriptions. Pre-treatment photographs are rarely taken to establish a baseline. A precise, quantitative method for measuring the course of KS after chemotherapy would improve the prognostic capabilities of the treating physician.

A clinical story may be told through the lens of a camera. As a proof of concept, our study proposed to determine the utility of a digital light field camera, a novel technology made by Lytro, at the bedside to track therapeutic responses to KS treatment.

**Structure/Method/Design:** Digital light field photography is capable of capturing a target at different focal lengths and thereby can

be reconstructed into 3D images. Using the Lytro camera, quantitative volume measurements were generated for a range of nodular KS lesions from patients (ages 17 to 50) admitted to the Dermatology ward at the MCH. Suitable lesions were selected based on nodularity, size, and location.

Follow-up images taken 5-8 days after initiation of chemotherapy were used to observe clinical progression, and images taken with an iPhone camera were used as a traditional method of photography for comparison. Photographs were then uploaded and sent to UCSD for computational processing.

**Results (Scientific Abstract)/Collaborative Partners (Programmatic Abstract):** Medical Education Partnership Initiative (MEPI; UC San Diego-University Eduardo Mondlane collaboration)

**Summary/Conclusion:** As seen in the initial analysis of images and processed depth maps, the Lytro technology exhibits unique advantages over a traditional camera. In terms of objectivity, the Lytro is superior to the iPhone in that its data files can be used to quantify the efficacy of treatment through volume changes in lesion size. Furthermore, the Lytro allows for a movable focus after the image has been captured. These are features unique to the Lytro and not currently available in any other camera commercially sold. The iPhone, in contrast, shows an advantage in ease of use at the bedside and immediacy of results.

Quantitative results from this pilot study are currently in submission for publication and will be used to obtain funding to establish a protocol of the imaging process and design a stand-alone application that can process the image files at the point of care. With additional development, this technology could provide better prognostic information and improve clinical practices, with broad applicability to populations in areas of Africa where the burden of epidemic HIV and Kaposi's sarcoma is highest.

### United States resident physician smartphone use during international clinical rotations

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**Background:** Smartphone use in clinical care has increased dramatically over the last decade and has the potential to improve efficiency and aid in clinical care. Studies have shown early adoption in the US graduate medical education system, and more recent data shows innovative uses abroad. Use by US residents in the international setting has not been studied. Given interest in global health by US residents, we conducted a survey to characterize resident smartphone use during their clinical rotations in the international setting.

**Structure/Method/Design:** An online anonymous survey was distributed in fall 2013 to current emergency medicine (EM) residents at the Harvard Affiliated program and select Internal Medicine (IM) residents at the University of Utah. This pilot study was aimed at identifying residents who had rotated at their program's international clinical sites to determine their smartphone use while outside the United States. Data collected included demographics, smartphone ownership and frequency of use in clinical settings, types of applications used, and barriers to use during clinical work in the international setting.

**Results (Scientific Abstract)/Collaborative Partners (Programmatic Abstract):** In this convenience sample, there were 51 respondents, 35 (69%) EM and 16 (31%) IM residents. 59% were

female and 63% were 20 to 30 yrs old. Eighteen out of the 51 (35%) had worked clinically in an international setting, including countries in Latin America, the Caribbean, Africa, the Middle East, and Asia. Of these, 14 (78%) owned a smartphone and 12 (67%) used it during international clinical work. Most reported owning 1 to 10 smartphone applications (apps); the three most common apps or features used were medication formulary, web access, and email access. During an average clinical month, 55% of residents used their smartphones often (once per day or every couple of days) and almost half used it anywhere from 1 to 15 minutes on an average clinical day. 73% stated that they used their smartphones less in an international setting than in the United States. The most common barriers to use were lack of wireless broadband internet (73%), cost of phone Internet data plan (37%), and lack of phone Internet data plan in the country (37%).

**Summary/Conclusion:** In this descriptive pilot study, we found that the majority of US EM and IM resident physicians who own a smartphone used it during their international clinical rotations. However, use was brief and limited by Internet accessibility, and was generally less than while in the United States. Further research is needed to characterize smartphone use by US and local physicians in developing countries, and to identify ways to overcome barriers to increase use and aid in clinical care.

### Organizing data in a remote clinical location: A mobile electronic data system (MEDS)

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**Background:** On international medical mission trips, a major challenge is keeping data on patient statistics in remote clinical locations. Having a reliable way to record this data is useful for planning subsequent trips in addition to identifying targets of transformation to help build a more sustainable health care within a community.

**Structure/Method/Design:** We have developed a way for health care providers to keep track of several in-clinic data points on international trips. Our solution is a mobile electronic data system (MEDS) program that is capable of being used in remote clinic locations without Internet access. It maintains patient demographics, vitals, diagnoses made, and medications dispensed. In addition, it attempts to improve clinic flow by streamlining patient data transmission within the mobile clinic to providers that may be responsible for providing medications and information to each patient. The program is compatible with many popular devices, including iPads, androids, and iPhones.

This program can save a significant amount of time and resources in planning for medical mission trips. The data it provides can assist trip planners in optimizing the formulary and inventory to best meet the needs of patients at various sites they serve.

**Results (Scientific Abstract)/Collaborative Partners (Programmatic Abstract):** We have worked with Dr. Eduardo Gonzalez and Project World Health to implement our project in the Dominican Republic.

**Summary/Conclusion:** We have had two successful deployments of this program during medical mission trips in the Dominican Republic, and are currently making improvements for its third use this March. Some of the challenges that we have been working to overcome include finding a reliable power source in a mobile setting and improving efficiency in the program's use. We are also expanding its encryption capabilities so groups that wish to save patient identifiers