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Abstracts

Causes of delay in the management of surgical conditions at Tamale Teaching Hospital in Ghana. Stephen Tabiri. From the Tamale Teaching Hospital, Tamale, Ghana.

Background: Improving access to surgical services and understanding the barriers to receiving timely care are necessary to save lives. The aim of this study was to assess delays among patients in northern Ghana using the Three-Model delays: timely presentation to appropriate health facility (first and second delay) and in-hospital delay (third delay). **Methods:** A total of 802 patients were assessed prospectively for first, second and third delays. Pairwise correlation coefficients between delay in presentation and factors associated with first, second and third delays were conducted and served as a foundation for a multivariate log-linear regression model. **Results:** Predicted longer first and second delays in receiving care were due to treatment from a traditional or religious healer ($p = 0.001$). On multivariate regression, emergent presentation was the strongest predictor of shorter delays (odds ratio [OR] 0.058, $p = 0.002$), while treatment from a traditional or religious healer and initially seeking treatment at another hospital predicted longer delays (OR 7.6, $p = 0.008$, and OR 4.3, $p = 0.006$, respectively). Mortality was significantly associated with the third delay ($p = 0.03$). **Conclusion:** Barriers to care leading to long delays in presentation are common in northern Ghana. Multifactorial institutional and limited resources accounted for the third delay. Interventions should focus on educating traditional and religious healers in addition to building surgical capacity at district hospitals. Constant improvement of logistics and infrastructure upgrading will likely reduce in-hospital delay.

Bloodless obstetric surgery in University of Calabar Teaching Hospital (UCTH). Nathaniel Usoro, Marcus Inyama, Iniabasi Ilori, Etim Ekanem. From the University of Calabar Teaching Hospital, Calabar, Nigeria.

Background: Avoiding allogeneic blood transfusion results in improved outcomes, protects patients' autonomy and avoids transfusion-transmitted infection. **Methods:** Data were collected prospectively in pro forma from all obstetric patients referred to the Bloodless Surgery Programme (BSP) in the University of Calabar Teaching Hospital from January to December 2018. Demographic data, diagnosis, preoperative hemoglobin, surgery done, surgeon, blood conservation techniques employed, end of surgery oxygen saturation in arterial blood (SaO₂), postoperative hemoglobin, hematological intervention, length of hospital stay, wound complications and any other complications were entered into an Excel spreadsheet and analyzed. **Results:** Eight obstetric patients were referred to the BSP with 7 diagnoses including placenta previa type 3 with antepartum hemorrhage, cephalopelvic disproportion, prolonged labour with multiple uterine fibroids, macrosomia, fetal congenital renal cyst, twin gestation and previous cesarian delivery. Preoperative hemoglobin ranged from 9.7 to 12.7 g/dL (mean 11.0 g/dL). All 8 patients had cesarian delivery, 2 as emergency and 6 as elective. In 1 elective case, bilateral tubal ligation was also performed. Two surgeries were done by consultants, 6 by residents. All 8 patients received tranexamic acid and vitamin K at surgery, and 1 patient also received colloid

infusion intravenously. The SaO₂ at end of surgery ranged from 96% to 99%. Postoperative hemoglobin at day 3 ranged from 6.3 to 13.5 g/dL (mean 10.05 g/dL). One patient received iron and erythropoietin intravenously. Length of stay was 3–8 days (median 4 d). Hemoglobin at discharge ranged from 8.3 to 13.5 g/dL (mean 10.3 g/dL). There was no wound complication and no other complications 30 days postoperatively. **Conclusion:** Bloodless surgery is the evidence-based option for ethical practice in a low-resource setting. It is simple, safer, cheaper and more effective.

Innovative strategies to improve the quality of surgical care services in Abim Hospital in Uganda. Joseph Kabogoza, B. Kitiyibwa, Francis Kisitu, R. Nalukenge. From the Rural Health Promotion and Poverty Alleviation Initiative (RUHPAI), Uganda (Kabogoza, Kitiyibwa, Kisitu); and the Council for Community Resilient Uganda (CCRU), Mukono, Uganda (Nalukenge).

Background: Surgical services are increasingly seen to reduce death and disability in sub-Saharan Africa, where hospital-based mortality remains alarmingly high. This study explored 2 implementation approaches to improve the quality of perioperative care in Abim Hospital in Uganda. Effects were compared with a control group of 2 other hospitals in the region without intervention. **Methods:** We conducted quality assessments with a Hospital Performance Assessment Tool. Changes in immediate outcome indicators after 1 and 2 years were compared with final outcome indicators such as anesthetic complication rate and surgical case fatality rate. **Results:** Immediate outcome indicators for preoperative care in the intervention hospital improved (52.5% in 2009 v. 84.2% in 2011, $p < 0.001$). Postoperative inpatient care initially improved, then declined (63.3% in 2009, 70% in 2010, 58.6% in 2011). In the control group, preoperative care declined from 50.8% (2009) to 32.8% (2011) ($p < 0.001$), while postoperative care did not significantly change. The anesthetic complication rate in the intervention hospital declined (1.89% before intervention v. 0.96% after intervention, $p = 0.006$). The surgical case fatality rate in the intervention hospital declined from 5.67% before the intervention to 2.93% after the intervention ($p < 0.001$). The surgical case fatality rate in the control group was 4% before the intervention and 3.8% after the intervention ($p = 0.411$). The anesthetic complication rate in the control group was not available. **Conclusion:** Specific interventions as part of continuous quality improvement might lead to sustainable improvement of the quality of care, if embedded in a multifaceted approach.

Innovative mobile solutions for ambulances in low-resource settings. A. Rosenberg, R. Rickard, F.Z. Uwinsbuti, P. Muyombano, G. Mbanjumucyo, J.M. Uwitonze, I. Kabagema, T. Dushime, S. Jayaraman. From the Virginia Commonwealth University Department of Surgery, Richmond, Virginia (Rosenberg, Jayaraman); the Rwanda Build Program, Rwanda (Rickard); the Service d'Aide Médicale Urgente – Rwanda Ministry of Health (Uwintonze, Muyombano, Uwitonze, Kabagema, Dushime); and the University Teaching Hospital of Kigali, Kigali, Rwanda (Mbanjumucyo).

Background: Global surgical collaborations offer opportunities for innovation due to necessity. While there is a robust prehospital ambulance service, which is rare in a poor country, communication among the ambulance, hospital and dispatch teams is inefficient. We created an innovative online ambulance service that addresses challenges in access to emergency medical services care in Kigali, Rwanda. **Methods:** Virginia Commonwealth University staff and Rwanda Build, a software accelerator, collaborated to determine interest in developing a prototype. Surveys were created to analyze the needs of the ambulance service. A prototype was designed using this information that addressed dispatch, ambulance runs and emergency department communication. **Results:** Surveys were collected from ambulance workers. A prototype was created with a user interface for the caller, dispatcher, ambulance and emergency department that includes GPS location, traffic light control and communication with on-road police. We predicted a reduction in ambulance travel time of 15–30 minutes. The prototype was pitched at a competition on developing innovative mobility solutions and was selected as 1 of 5 finalists out of 176. It was approved by the Rwandan Ministry of Health for further development and testing. **Conclusion:** This prototype shows us how we can use a collaboration between local academics, medical staff and technology developers to design useful and functioning medical services. Pilot implementation to assess the impact on patient care and outcomes is anticipated in 2019. Low- and middle-income countries offer tremendous chances to think outside the box because of inherent resource constraints and offer US surgical residents unmatched opportunities to learn about medical innovation.

Cost-effectiveness analysis of cesarean delivery rates and access. *Lina Roa, Luke Caddell, Jordan Pyda, Adeline Boatin, Mark Shrimme.* From the Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA (Roa, Caddell, Pyda, Boatin, Shrimme); the Department of Obstetrics & Gynecology, University of Alberta, Edmonton, Canada (Roa); the Department of Obstetrics & Gynecology, Massachusetts General Hospital, Boston, Massachusetts, USA (Boatin); and the Center for Global Surgery Evaluation, Massachusetts Eye and Ear Infirmary, Boston, Massachusetts, USA (Shrimme).

Background: The cesarean delivery (CD) rate and access to comprehensive emergency obstetric care (CEmOC) vary in low- and middle-income countries, with women in rural areas lacking access to life-saving surgery and those in urban areas exposed to nonindicated surgical procedures. This study assessed the cost-effectiveness of strategies with different CD rates and CEmOC access. **Methods:** A decision analysis model estimated the cost of care and maternal outcomes in 6 different scenarios of CD rate and CEmOC access in India: 1) current rural CD rates and access, 2) current urban CD rates and access, 3) national average CD rates and access, 4) increasing rural access to urban level, 5) increasing rural CD rate to urban level and 6) decreasing urban rate to the 15% recommended by the World Health Organization. We considered all women of reproductive age, performing first-order Monte Carlo simulation using a 1-year cycle. All costs, probabilities and utilities were derived from the literature.

A societal perspective was used, with a willingness-to-pay threshold of \$1940, India's gross domestic product per capita. **Results:** The most cost-effective strategy was CEmOC access and CD rates as they currently is in rural areas (33.30 quality-adjusted life years [QALYs] at \$900.08). All other strategies were dominated. Since the current rate of access to CEmOC in rural areas is 47.9%, a morally unacceptable policy, we considered alternative strategies. The next best strategy was increasing access to CEmOC facilities while keeping current CD rates seen in rural areas (33.30 QALYs at \$1149.43). **Conclusion:** This model could help guide policy-makers to support increased access to CEmOC where appropriate while avoiding harm from unnecessary CD and ensuring equitable surgical care between women living in rural and urban areas.

Capacity and averted surgical burden in the North Kivu Province of the Democratic Republic of the Congo. *Luc Malemo, Sarah Cairo, David Nguyen, Tom Diebl, Tianyi Shao, Christian M. Salmon, David H. Rothstein, Dan Poenaru.* From HEAL Africa, Goma, Democratic Republic of the Congo (Malemo); the Maine Medical Center, Portland, Maine, USA (Cairo); Queen's University, Kingston, Ontario, Canada (Shao); Western New England University, Springfield, Massachusetts, USA (Salmon); the University at Buffalo, State University of New York, New York, USA (Rothstein); and the McGill University Health Centre, Montreal, Quebec, Canada (Nguyen, Malemo, Poenaru).

Background: This study aimed to assess the surgical capacity of various health sectors in North Kivu province and correlate it to averted surgical burden. **Methods:** Cross-sectional survey of facilities performing surgery in all 33 health zones of North Kivu between January and December 2017. Facility data and surgical volumes were collected using the Program in Global Surgery and Social Change/World Health Organization hospital assessment tool and operating room registries. Factors influencing delivery of essential surgery were analyzed. **Results:** Forty-four facilities were included: 36 district hospitals, 4 regional hospitals and 4 health centres, 57% of which were nongovernmental/faith-based (NG-FB). Per 100 000 population there were 78.4 beds, 1.2 operating rooms, 0.4 surgeons and 2.2 nonsurgeons providers performing surgery, 0.8 anesthesia technicians and 0 physician anesthetists. World Health Organization essential hospital equipment/supplies were adequate in 85% of governmental and 87% of NG-FB regional hospitals, 52% and 65% of district hospitals, and 28% and 53% of health centres, respectively. District and regional hospitals accounted for 75% and 18%, respectively, of all surgeries, while NG-FB facilities provided 60% of surgeries. The surgical intervention rate per 100 000 was 481 for adults and 49 for children, 10 times lower than recommended. Procedures were 64.0% obstetrical/gynecological, 18.9% general surgical and 14.8% trauma-related, with predominantly emergency surgery being performed in rural and unsafe areas. **Conclusion:** Access to, workforce for and delivery of essential surgery in North Kivu is very limited. District hospitals and NG-FB facilities provide most surgical care. There is an urgent need for improving all aspects of surgical care in the region.

Trauma and Disaster Team Response course as a means to improve interprofessional care delivery in resource-limited settings. *Anudari Zorigtbaatar, Rachel Nadeau, Andrew Beckett, Paola Fata, Kosar Ali Khwaja, Jeremy Grushka, Tarek Razek, Dan Deckelbaum.* From the McGill University Faculty of Medicine, Montreal, Quebec, Canada (Zorigtbaatar); the Centre for Global Surgery, McGill University Health Centre, Montreal, Quebec, Canada (Nadeau, Razek, Deckelbaum); and the Division of Trauma Surgery, McGill University Health Centre, Montreal, Quebec, Canada (Beckett, Fata, Khwaja, Grushka, Razek, Deckelbaum).

Background: Injuries are a leading cause of mortality and morbidity worldwide, especially in low- and middle-income countries. The Trauma and Disaster Team Response course (TDTR) was designed by the Centre for Global Surgery at the McGill University Health Centre to train multidisciplinary teams in trauma care delivery. This course aims to identify local trauma teams, understand team roles and responsibilities, and highlight trauma and disaster care principles. **Methods:** The TDTR course is a 2-day course combining 12 didactic lectures, 5 skills stations and 4 team exercises. The local institution chooses the participants based on the diversity of health care professionals in its trauma unit. A third day of training is organized to train local TDTR instructors among those who attended the previous days. **Results:** Since the first TDTR course in 2016, 11 courses with a mean of 24 participants were organized, and local instructors were trained in 9 countries. In Ukraine, TDTR instructors now teach the course independently, and those in other countries teach it with supervision. Mannequins were available for the skills stations in 4 countries, but animal models were used in Palestine, Mozambique, Ukraine and Haiti. In Mongolia, low-fidelity simulation models were built with the local team. **Conclusion:** Team-based training is essential given that trauma teams are multidisciplinary. The delivery of adequate and timely care depends on the collaboration of all health care professionals on the team. Training courses need to adapt to local context and target their specific needs to ensure the autonomy of local instructors in maintaining the courses.

Assessing surgical quality in a low-resource setting with a novel hospital assessment tool: a pilot study in Brazil. *Rodrigo Vaz Ferreira.* From the Universidade do Estado Amazonas, Manaus, Brazil.

Background: Adverse events from surgical care are a major cause of death and disability in low- and middle-income countries (LMICs). Metrics for quality of surgical care in high-income countries are resource-intensive and inappropriate in most LMIC settings. A new tool to measure surgical quality in LMICs was recently developed. The purpose of the study was to conduct a pilot study to evaluate the feasibility of applying this tool in a resource-constrained setting. **Methods:** The pilot was performed at a tertiary hospital in Amazonas, Brazil. The tool was adapted to the local context, resulting in 14 metrics. The presence of a morbidity and mortality conference, perioperative mortality rate, procedure density and readmission rates were retrospectively extracted from the hospital administrative data and operating room (OR) logbooks. The remaining met-

rics were collected prospectively during a 4-week period by external data collectors using an OR observation checklist and a patient discharge questionnaire adapted from validated tools. **Results:** A total of 183 surgeries were observed and 125 patient questionnaires administered. All metrics were successfully collected using the modified tool. The tool also allowed collection of the 6 Lancet global surgery indicators. **Conclusion:** It is feasible to apply this surgical quality-measurement tool in resource-limited settings. With further applications of the tool in other low-resource settings, the measures and targets can be refined and a weighting system developed to better guide surgical quality-improvement measures at the facility, regional and national levels.

Single v. extended antibiotic for prevention of surgical infection in emergent cesarean delivery. *David Ntirushwa, Rabel Ghebre, Marie Aimee Unyuzimana, Urania Magriples, Maria Small, Stephen Rulisa.* From the University of Rwanda, Kigali, Rwanda (Ntirushwa, Ghebre, Magriples, Small, Rulisa); the Yale University School of Medicine, New Haven, Connecticut, USA (Ghebre, Magriples, Small); the Ruhengeri Hospital, Ruhengeri, Rwanda (Unyuzimana); and Duke University, Durham, North Carolina, USA (Small).

Background: Emergency cesarean delivery (CD) saves lives but is associated with increased risk of surgical site infection (SSI). Extended dosing of prophylactic antibiotics is used as one strategy to reduce the increased risk in SSI but poses the risk of increasing antimicrobial resistance. **Methods:** This randomized clinical trial assessed all patients undergoing emergency CD in a rural district hospital in Rwanda from 2015 to 2016. Eligible participants were randomly allocated to 2 groups and were followed for 30 days after CD for SSI. Both groups A and B received 1 dose of 2 g of ampicillin 15–60 minutes before skin incision, and group B also received 1 g of ampicillin three times daily, 3–7 days after CD. Telephone interviews were performed on days 3, 7, 15 and 30. **Results:** Data for 301 participants were analyzed (147 in group A and 154 in group B). There were 8 SSIs in group A and 4 in group B ($p = 0.089$). The overall prevalence of SSI was 4.00%. Most SSIs were diagnosed on day 7 (66.6% of all cases), and only 22.2% of cases were diagnosed at discharge (day 3). One case was diagnosed on day 15 and no new cases on day 30. **Conclusion:** Use of single-dose antibiotic prophylaxis is recommended in emergent CD, as no difference was observed between the single and multiple doses of antibiotics for prevention of SSI.

Impact of a medical information form on anxiety level of patients before elective surgery in a sub-Saharan African hospital. *C. Bougouma, A. Zongo, M. Baghyan, M. Lankoande, S. Traore, R. Kabore.* From the Service d'anesthésie réanimation, Centre Hospitalier Universitaire de Tingandogo, Tingandogo, Burkina Faso (Bougouma, Kabore); the Service d'anesthésie réanimation, Centre Hospitalier Universitaire de Yalgado Ouédraogo, Burkina Faso (Zongo, Baghyan); Service d'anesthésie réanimation, Centre Hospitalier Régional de Koudougou, Koudougou, Burkina Faso (Lankoandre); and the Service d'anesthésie réanimation, Centre Hospitalier Universitaire de Bogodogo, Bogodogo, Burkina Faso (Traore).

Background: This study aimed to assess the impact of written medical information on preoperative anxiety level for patients waiting for surgery. **Methods:** Prospective cohort study conducted from February to April 2018 on the assessment of preoperative anxiety of patients before and after the introduction of a form of medical information. Patients were divided randomly into 2 groups. Patients in group 1 (G1) did not receive the medical information form, and patients in group 2 (G2) received the form. The State-Trait Anxiety Inventory was administered just before anesthesia consultation and at the time of the preanesthetic visit on the day of the intervention. **Results:** The study population comprised 102 patients, 51 in either group. The 2 groups of patients were comparable for age, sex and level of schooling. The frequency of anxiety before the preanesthetic consultation (PAC) was comparable in the 2 groups (37% in G1 and 39% in G2). After the PAC, 61% and 24% of patients, respectively, were anxious ($p = 0.0003$). There was a relation between the level of knowledge about anesthesia and anxiety after the PAC. **Conclusion:** Preoperative receipt of a medical information form contributed to reducing anxiety in patients waiting for surgery. It should be systematic and properly codified during anesthesia consultation.

Global health electives: ethical engagement in building global health capacity. *A. De Visser, G. Hollaar, J. Hatfield, J. Seni, J. Najjuma, W. Arubaku.* From the University of Calgary, Calgary, Alberta, Canada (De Visser, Gollaar, Hatfield); the Catholic University of Health and Allied Sciences, Mwanza, Tanzania (Seni); and the Mbarara University of Science and Technology, Mbarara, Uganda (Arubaku, Najjuma).

Background: Increasingly, medical trainees are seeking global health electives (GHEs) as part of their medical education. However, little is known about the impact medical trainees taking GHEs have on host institutions, staff, local trainees, patients or communities in low- and middle-income countries. **Methods:** The goal of this study was to explore the relationship dynamics associated with GHEs as perceived by stakeholders at 3 sites in sub-Saharan Africa. We examined stakeholder perspectives in Mwanza, Tanzania, and Mbarara and Rugazi, Uganda, where the University of Calgary Cumming School of Medicine has long-standing institutional collaborations. In this case-based interpretive phenomenological study, 34 host stakeholders (health facility administrators, physicians, clinical officers, registrars, nurses and community liaison members) participated in semistructured interviews, and 28 host stakeholders (medical students, residents, interns and patients) participated in focus groups. **Results:** The findings revealed that, although GHEs are well-established and a common experience for host stakeholders, there are many indistinct aspects that are poorly understood by host stakeholders. Participants acknowledged that there are a variety of benefits they gain because of GHEs, but, overall, visiting medical trainees benefit the most from this unique learning opportunity. Despite reluctance to directly admit harms, host stakeholders described considerable challenges and burdens of GHEs and recommended ways in which GHEs could be improved to work toward relationships that are mutually beneficial and equitable. **Conclusion:** One of the main recommendations from this study is

that, to work toward an equitable, effective and ethical elective, GHEs should occur between collaborating institutions with a bidirectional focus.

The contribution of the University of Cape Town to the training of African surgeons. *Priyanka Naidu, Johannes Fagan, Carina Lategan, Liam Devenish, Kathryn Cbu.* From the University of Cape Town, Cape Town, Africa.

Background: Sub-Saharan Africa (SSA) has a shortage of surgeon specialists. Many SSA countries lack residency programs, but South Africa, a middle-income country, has several postgraduate surgical training programs. The objective of this study was to identify benefits and barriers of training non-South African SSA surgeons at the University of Cape Town. **Methods:** This was a 2-part cross-sectional survey administered between June 1, 2018, and March 1, 2019 to surgical heads of divisions, and surgical residents and fellows who graduated between 2007 and 2017 and whose home country was in SSA excluding South Africa. All data were captured on REDCap, a secure online database. **Results:** Seven (70%) of 10 division heads responded and reported benefits of having SSA trainees, including having more junior staff (5 respondents [71%]) and the establishment of regional networks (4 [57%]) (Table 1). Negative impacts included increased training load (2 [28%]) and fewer cases for South African trainees (2 [28%]). Fourteen (50%) of 28 trainees responded, all of whom were male. Ten (71%) had returned to their country of origin; 6 (60%) were working in the private sector, and 4 (40%) worked in teaching hospitals. **Conclusion:** Sub-Saharan surgeons can utilize regional training programs until their own countries increase their training capacity. The advantage of staying in the region is that training environments are comparable to their home environments. The majority of trainees returned to their countries of origin, and 40% were involved in the teaching of more trainees. The expansion of these programs is warranted including the active recruitment of female SSA surgery trainees.

Table 1. Benefits and negative impacts of training non-South African sub-Saharan African (SSA) surgeons

Benefit/negative impact	% of respondents
Perceived benefits of SSA training program	
More junior doctors to care for patients	71.2
Increased quality of University of Cape Town surgical trainees	42.8
Continued clinical collaboration with previous trainees	57.1
Continued research collaboration with previous trainees	42.8
Diversity in registrar body, awareness of African issues in health care	14.2
Internationalization	14.2
Building links with African countries and establishing the University of Cape Town internationally	14.2
Perceived negative impacts of SSA training program	
Increased teaching load	28.5
Fewer cases for South African trainees	28.5
Decreased quality of University of Cape Town surgical trainees	0.0
Increased personal and financial strain on non-South African SSA trainees	14.2

Strengths, weaknesses, opportunities and threats of the postgraduate surgical training in East, Central and Southern African regions: a survey conducted among COSECESA surgeons and trainees. *H.M. Lekuya, R. Mbiine, M. Galukande.* From the Department of Surgery, Makerere University, Kampala, Uganda.

Background: Sub-Saharan Africa has the highest need to expand surgical care delivery by training more surgeons. With the recent efforts of training surgeons by different regional programs, such as the College of Surgeons of East, Central and Southern Africa (COSECESA), there are challenges to be addressed regarding surgical training standards. We aimed to critique the current postgraduate surgical training in the east, central and southern African (ECSA) regions. **Methods:** A mixed-methods study was conducted among surgeons and surgical trainees from the ECSA regions from June to August 2018. Both quantitative and qualitative data were collected in a SWOT (strengths, weaknesses, opportunities, threats) analysis approach regarding the current surgical training activities using an electronic questionnaire sent by email from the COSECESA database. This research was approved by the COSECESA ethical committee. **Results:** A total of 109 surgeons and surgical trainees (15.6% female) from 13 ECSA countries responded. The median age category was 31–35 years. Almost half of the respondents (44%) were from general surgery, and one-quarter (24%) were from orthopedics. About 64% responded that it was relevant to train surgeons in their home country, and 55.2% considered that there was high chance of “brain drain” if surgeons were trained overseas. In contrast, 84.3% stated that research experience was lacking in their surgical curriculum, and 80.7% declared that their home hospitals were poorly equipped for appropriate training. **Conclusion:** There are several weaknesses in the postgraduate surgical training in the ECSA region. Partnership with funding institutions is needed to boost the training.

Anesthesiology training in Ethiopia: a cross-sectional study of factors influencing career choice in anesthesiology and the challenges faced during residency training in Ethiopia. *Rabel Tilahun Melaku.* From Black Lion Hospital, Addis Ababa, Ethiopia.

Background: The number of physicians applying for anesthesiology residency training in Ethiopia has increased. The purpose of this study was to determine the factors influencing career choice in anesthesiology and assess the challenges faced during training. **Methods:** Semistructured questionnaires were distributed to all anesthesiology residents in Ethiopia after Institutional Review Board approval was obtained from the Addis Ababa University College of Health Sciences and informed consent was obtained from each participant. **Results:** The 45 residents came from 7 different medical schools. Twenty-six (57.8%) had an anesthesia attachment during medical school, and 26 (57.8%) chose anesthesia as their first choice of specialty. The most common reason for choosing anesthesia was good future career prospects (28 [62.2%]). Eleven (24.4%) were not happy with their choice of specialty. Twenty-seven (60.0%) were not satisfied with the teaching program of the residency. Twenty-nine (64.4%) were dissatisfied with the working conditions of the hos-

pital where they were doing clinical rotations. Forty-one (91.1%) said they were dissatisfied with the availability of teaching and available equipment and consumables. Ten (22.2%) would not recommend that other physicians join, anesthesiology, and 8 (17.8%) were planning to change their career after graduation. **Conclusion:** Increasing anesthesiology attachment and exposure at the undergraduate medical level may attract more physicians, and improving the supply of consumables and equipment may increase the satisfaction and retention of residents.

What we've learned from sending residents abroad: how to prepare residents for international rotations. *Sara Strowd, Rebecca McGoldrick, Michelle Duperrault.* From Stanford University, Stanford, California, USA.

Background: The Stanford Division of Global Anesthesia has sent a cohort of residents abroad yearly for educational and research electives and medical missions. In order to prepare residents for these experiences and potentially a career in global anesthesia, a global resident pathway was created after gaining feedback from previous experiences. Applicants were asked to apply during their postgraduate year 2 or 3 in order to complete the curriculum in 2–3 years. **Methods:** Each resident is paired with a Stanford faculty mentor to oversee his or her progress. Additionally, the resident serves as a mentor to our Rwandan partner site trainees participating in an observership at Stanford. The curriculum includes a career in global anesthesia lecture series that invites faculty members to share their experiences and research in global anesthesia through lectures, journal clubs and workshops. Topics include international partnerships, anesthetic subspecialties, ethics, anesthetics in austere environments, cultural competency and global surgery. The pathway also allows residents to take advantage of the global health research methods course tailored for clinical trainees to get hands-on practice and guidance in creating their projects. By the time the residents graduate, it is expected that they will have presented a research project at 1 conference in global health or medical education. These residents will also have the opportunity to participate in a 4-week international teaching rotation at one of Stanford anesthesia department's partner sites. Surveys assessing the level of resident preparedness and relevance of the lectures will be used to assess the pathway's effectiveness.

First Trauma and Disaster Team Response course in Mongolia: creation of low-fidelity simulation models. *Anudari Zorigtbaatar, Tumenbayar Chuluunbaatar, Munkhdelger Myagmarsuren, Rachel Nadeau, Khishigsuren Otgonsuren, Tarek Razek, Dan Deckelbaum.* From the Faculty of Medicine, McGill University, Montreal, Quebec, Canada (Zorigtbaatar); the National Trauma and Orthopedic Research Centre, Ulaanbaatar, Mongolia (Chuluunbaatar, Myagmarsuren, Otgonsuren); the Division of Trauma Surgery, McGill University Health Centre, Montreal, Quebec, Canada (Razek, Deckelbaum); and the Centre for Global Surgery, McGill University Health Centre, Montreal, Quebec, Canada (Nadeau, Deckelbaum).

Background: In Mongolia, injuries are the third-leading cause of death and the primary cause of morbidity among males under 44 years of age. The National Trauma and Orthopedic Research

Centre, Mongolia's only trauma referral hospital, held its first Trauma and Disaster Team Response (TDTR) course in 2018. Low-fidelity simulation models were built for its skills stations. **Methods:** We conducted a survey to assess the general demographics of the participants and their appreciation of the course based on the clarity of the objectives, the different teaching methods and the structure of the course. **Results:** Sixteen doctors, 14 nurses, 1 physiotherapist and 3 surgical residents attended the course, and, among those, 5 local instructors were trained. The lectures, skills stations and team exercises were found very useful or useful by all the participants. The combination of teaching methods was identified as the major strength of this course. Low-fidelity models were built to practise cricothyroidotomy procedures and chest tube insertions (Figs. 1 and 2). Each one costs around 10 000 ₮ (US\$3.80), and both were built with plumbing material. Animal models were previously used in other countries because of their resemblance to human anatomy, but, in Mongolia, the decision was made to create low-fidelity models. **Conclusion:** The first TDTR course in Mongolia was a great success owing to its adaptation to local resources. Low-fidelity models are excellent alternatives to animal and high-fidelity models, which may lead to high costs or ethical concerns. In the coming year, additional courses will be held, with expected progressive autonomy of local instructors.



Fig. 1. Low-fidelity simulation device for cricothyroidotomy.



Fig. 2. Low-fidelity simulation device for chest tube insertion.

The challenges of surgical ethics in Nigeria: doing a lot without knowing a lot. *Oluwadiya Kehinde, Johnson Dare Ogunlusi, Moruf Babatunde Yusuf, Popoola Sunday Ogunsuyi, Obafemi K. Wuraola, Wabeed O. Babalola, Oduwole Olayemi Ajogbasile.* From the Department of Surgery, Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria (Kehinde, Ogunlusi, Yusuf, Ogunsuyi, Wuraola, Babalola); and the Department of Nursing, Perioperative Unit, Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria (Ajogbasile).

Background: The past 3 decades have seen a profound increase in both societal and professional awareness of ethical issues in surgery in Western countries. A similar development is slowly taking place in developing countries. We set out to determine the knowledge of and confidence in surgical ethics among surgeons and residents in Nigeria. **Methods:** Using social media as a platform of dissemination and Google Form as the tool, we conducted an online survey of junior residents (JR), senior residents (SRs) and surgeons in surgical specialties in Nigeria. **Results:** A total of 148 people completed the online form, 41 residents (27.7%) and 107 specialists (72.3%) in 10 surgical subspecialties. Most respondents experienced the following ethical challenges at least once every quarter: conflict of interests (73.3%), professional obligations (83.5%), confidentiality (94.5%), truth telling (96.5%), surrogate decision-making (58.2%) and end-of-life issues (51.4%). While the specialists scored higher than residents on the Confidence in Surgical Ethics Scale (median score 4.0 for consultants and 3.7 for SRs and JRs, $p = 0.003$), they scored significantly lower on the Knowledge of Surgical Ethics Scale (median score 56.2% for consultants, 72.2% for SRs and 62.4% for JRs, $p = 0.005$). **Conclusion:** Doctors in the surgical specialties frequently experienced ethical challenges at work. The study seems to indicate that the knowledge base of surgical ethics is poor and is worse for surgeons than resident doctors. We advocate continuing medical education in surgical ethics in Nigeria.

Self-testing for cervical cancer using minimally invasive ddPCR-based swabs in Kenya: a feasibility and proof-of-concept study. *Andre Isaac, Devon Woznick, Lilian Mbau, Catherine Nyongesa-Watta, Chizi Kiti, Dennis Mwiti, Vincent Biron.* From the Division of Otolaryngology – Head and Neck Surgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada (Isaac, Biron); Innovative Canadians for Change, Edmonton, Alberta, Canada (Woznick); and Amref Health Africa, Kenya Country Office, Nairobi, Kenya (Mbau, Nyongesa-Watta, Kiti, Mwiti).

Background: Kenya has among the highest incidence of cervical cancer (CC) in the world; however, only 3% of women are screened. Self-testing methods have the potential to decrease CC prevalence. This study aimed to assess the feasibility and proof of concept for a novel minimally invasive assay for CC self-screening using droplet digital polymerase chain reaction (ddPCR)-based swabs in Kenya. **Methods:** Prospective validation study at a tertiary care centre in Nairobi, Kenya. The feasibility of a self-testing model was assessed via surveys of at-risk women and women with known CC. A subset of women from either group underwent self-administered and physician-administered tests analyzed by ddPCR to detect human

papillomavirus-16 and -18 mRNA for oncoproteins E6 and E7. Financial feasibility was assessed via cost analysis. **Results:** A total of 100 at-risk women and 25 women with CC were recruited. While 76% of women knew about cervical cancer, only 44% believed themselves to be at risk, while less than 30% had ever had screening. The most common barriers were lack of awareness and access. A total of 72% would be more willing to undergo screening if a self-test were available. Four women from either group underwent testing with a self-swab and physician-administered swab. All swabs had sufficient DNA for ddPCR analysis. All women with CC tested positive for oncogenic HPV mRNA, whereas none of the control participants were positive. **Conclusion:** Effective CC screening programs are needed in Kenya. Self-screening using ddPCR-based swabs is culturally and socially acceptable, as well as feasible. This method provides a viable alternative to traditional screening and should be further validated prospectively.

The burden of and attitude toward female genital mutilation in Enugu State, Nigeria — our women's perspective. *U.O. Ezomike, J.M. Chinawa, J.T. Enebe, E.C. Ezugwu, E.C. Aniwada, N.E. Ezomike, A.T. Chinawa, S.O. Ekenze, B.C. Ozumba.* From the Sub-Department of Pediatric Surgery, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Ezomike, Ekenze); the Department of Pediatrics, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Chinawa, Ezomike); the Department of Obstetrics and Gynecology, Enugu State University Teaching Hospital, Enugu, Nigeria (Enebe); the Department of Obstetrics and Gynecology, University of Nigeria Teaching Hospital Ituku/Ozalla, Enugu, Nigeria (Ezugwu, Ozumba); the Department of Community Medicine, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Aniwada); and the Department of Community Medicine, Enugu State University Teaching Hospital, Enugu, Nigeria (Chinawa).

Background: Female genital mutilation (FGM) in early childhood is still practised in some areas of the world, especially Africa and Asia, despite being fraught with debilitating complications and having no health benefits. This study aimed to assess the burden of and attitude toward FGM and factors that predispose a girl to have FGM. **Methods:** Printed forms of a structured questionnaire on FGM were prepared and administered by interviewers to pregnant women attending antenatal clinics in 2 teaching hospitals in Enugu, Nigeria. Their responses were entered into SPSS and frequencies calculated. Bivariate analysis was done, calculating χ^2 and p values. A p value < 0.05 was deemed significant. Multivariate analyses were done for those with significant p values to calculate adjusted odds ratio (OR) and 95% confidence interval (CI). **Results:** There were 461 respondents, of whom 123 (26.7%) were circumcised, 25 (5.4%) had circumcised a daughter, and 22 (4.8%) would circumcise the next child if female. Twenty-nine husbands (6.3%), 71 (15.4%) of the women's mothers and 46 (10.0%) of the women's mothers-in-law supported FGM. On bivariate analysis, educational level of the woman below tertiary level ($\chi^2 = 19.683$, $p < 0.001$), educational level of the husband below tertiary level ($\chi^2 = 7.627$, $p = 0.022$) and FGM in the woman ($\chi^2 = 23.069$, $p < 0.001$) were significant risk factors

related to the likelihood of a girl's having FGM. On multivariate analysis, the adjusted ORs were 0.63 (95% CI 0.2–2.02), 0.54 (95% CI 0.17–1.77) and 0.15 (95% CI 0.06–0.39), respectively. **Conclusion:** A substantial proportion of our unborn girls face the risk of FGM, especially when the mother has had FGM. Education up to the tertiary level in parents significantly reduces this risk.

Domestic violence is an important cause of intentional injury at Mbarara Regional Referral Hospital, Uganda. *Tessa Robinson, Brian H. Cameron, Christine Tumuhimbise, Consolet Ninsiima, Abdullah Saleh.* From the Department of Surgery, McMaster University, Hamilton, Ontario, Canada (Robinson, Cameron); the McMaster Pediatric Surgery Research Collaborative, McMaster University, Hamilton, Ontario, Canada (Robinson, Cameron); the Mbarara Regional Referral Hospital, Mbarara, Uganda (Tumuhimbise); and the Division of Pediatric Surgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada (Ninsiima, Saleh).

Background: Domestic violence (DV) is an increasing public health concern in the developing world, yet understanding of its causes and prevalence remains limited. This project aimed to describe the prevalence and nature of injuries resulting from DV at a large referral hospital in Uganda. **Methods:** A trauma registry was instituted at Mbarara Regional Referral Hospital (MRRH) in Mbarara, Uganda in March 2017. Data collection was completed by 2 experienced local nurses. Data pertaining to incidents of DV among patients between registry inception and January 2019 were abstracted and analyzed. **Results:** A total of 2354 patients were enrolled in the registry; 424 suffered intentional injuries, of which 93 (21.9%) were due to DV. The most common mechanisms of injury were stabs/cuts (71 [76%]) and burns (17 [18%]). Alcohol was involved in 18 incidents (19%). Of the 93 patients, 42 (45%) had an operation, and 12 (13%) died. Among adult DV victims, intimate partner violence was the cause for 27 (71%) of the 38 women, compared to 8 (19%) of the 42 men ($p < 0.00$). Children aged 17 years or less accounted for 13 DV injuries (14%), with a majority (8 [62%]) being injured by their mother. **Conclusion:** This study serves as a first step in describing the burden of DV at MRRH but likely underestimates its prevalence. Victims may be unwilling to disclose the true cause of injuries or may not seek medical treatment. Future work should focus on training health care workers on DV screening protocols to improve the identification of victims and reduce the risk of further injury.

The high burden of unmet pediatric surgical needs in Somaliland. *Sbugri Dahir, Tessa Concepcion, Mubarak Mohamed, Edna Adan Ismail, Dan Poenaru, Henry Rice, Emily R. Smith.* From the Edna Adan Maternity Hospital, Hargeisa, Somaliland (Dahir, Mohamed, Ismail); the Duke Global Health Institute, Duke University, Durham, North Carolina, USA (Concepcion, Rice, Smith); BethanyKids, Africa (Poenaru); the Department of Surgery, McGill University, Montreal, Quebec, Canada (Poenaru); the Division of Pediatric Surgery, Duke University, Durham, North Carolina, USA (Rice); and the Department of Public Health, College of Health and Human Sciences, Baylor University, Waco, Texas, USA (Smith).

Background: Although surgical conditions are increasingly recognized as causing a substantial health care burden in adults in low- and middle-income countries (LMICs), the burden of surgical conditions in children in LMICs remains poorly defined. The objective of this study was to measure the burden of pediatric surgical conditions across Somaliland using a nationwide community-based household survey. **Methods:** Our study took place in Somaliland, a country in the Horn of Africa, the fourth-poorest country in the world. Mortality rates among infants and children less than 5 years are over twice as high as overall mortality rates in sub-Saharan Africa. We measured the prevalence of pediatric surgical conditions using a country-wide community-based sampling survey from August through December 2017. **Results:** Among the 1503 children surveyed, we identified 221 surgical conditions in 196 children, yielding a prevalence of pediatric surgical conditions of 12.2% ($\pm 1.5\%$). Between 40% and 75% of these conditions were not surgically corrected. The most common conditions encountered were congenital anomalies (33.8%) and wound-related injuries (24.6%). The prevalence of unmet surgical conditions was higher in the rural regions than the urban regions of the country. **Conclusion:** Using national sampling, we found that children in Somaliland have a high burden of surgical conditions. Nationally, surgical conditions affect an estimated 246 000 children, with an estimated 93 000–209 000 children having unmet surgical needs. Our data highlight the need for scale-up of pediatric surgical infrastructure and resources to provide the needed surgical care for children in LMICs.

Improving obstetrics care practices in rural areas of Uganda using spatial modelling. *Bull Kitibwa, John Bale, Agnes Nakawesi.* From the Grassland Community Initiatives Uganda (GCIU), Rakai, Uganda (Kitibwa, Bale); and Makerere University, Kampala, Uganda (Nakawesi).

Background: Increasing coverage of institutional deliveries in Uganda may not translate into mortality reduction if shortage of qualified staff and lack of enabling working conditions affect quality of services. The study aimed to assess, in a high-facility-density rural context, whether a health system organization with fewer delivery sites is feasible in terms of population access. **Methods:** Geospatial raster and network analysis were performed to estimate access to obstetric services in walking time. The present geographical accessibility was compared with a theoretical scenario with a 40% reduction of delivery sites. **Results:** About half of first-line health facilities had insufficient staff to offer full-time obstetric services (45.7% in Rakai District and 78.8% in Kyotera District). The annual delivery caseload at first-line health facilities was low, with fewer than 100 deliveries in 48/70 and 43/52 facilities in Rakai and Kyotera districts, respectively. Wide geographical overlaps of facility catchment areas were observed. In Rakai, 54% of the population was within 1-hour walking distance from the nearest facility and 87.8% within 2 hours; in Kyotera, the corresponding proportions were 39.9% and 82.3%. With a 40% reduction of delivery sites, approximately 80% of the population would still be within 2 hours' walking time. **Conclusion:** Our findings from spatial modelling in a high-facility-density context indicate that reducing delivery sites by 40% would decrease population access within 2 hours by 7%. Focused efforts on fewer delivery sites might assist strengthening delivery services in resource-limited settings.

Prevalence and outcome of chronic malnutrition in pediatric surgical patients at Kigali University Teaching Hospital, Rwanda. *Celestin Seneza, Daniel I. McIsaac, M. Dylan Bould.* From the Kigali University Teaching Hospital, University of Rwanda, Kigali, Rwanda (Seneza); the Department of Anesthesiology and Pain Medicine, University of Ottawa, Ottawa, Ontario, Canada (McIsaac); the School of Epidemiology and Public Health, University of Ottawa, Ottawa, Ontario, Canada (McIsaac); and the Children's Hospital of Eastern Ontario, University of Ottawa, Ottawa, Ontario, Canada (Bould).

Background: Malnutrition is common in pediatric surgical patients in low- and middle-income countries, and children are particularly at risk for poor outcomes after surgery. We aimed to identify whether severe chronic malnutrition was associated with increased postoperative length of stay (LOS) among pediatric surgical patients. **Methods:** Prospective observational cohort study. We enrolled surgical patients aged 1 month to 15 years. We measured the association of chronic malnutrition with postoperative LOS using log-gamma regression to account for the skewed LOS distribution. Adjustment was made for sex, age, elective v. emergency surgery, household income and American Society of Anesthesiologists classification. **Results:** Among 593 children, severe chronic malnutrition was present in 82 (14%); 78 (13%) had moderate chronic malnutrition. The mean LOS after surgery was 5.0 (standard deviation [SD] 7.0) days for children with mild/no malnutrition, 6.2 (SD 6.5) days for children with moderate malnutrition and 8.9 (SD 10.0) days for children with severe malnutrition. Prior to adjustment, severe, but not moderate, malnutrition was associated with increased LOS (ratio of means [RoM] v. no/mild malnutrition 1.78, 95% confidence interval [CI] 1.42–2.25, $p < 0.001$ for severe malnutrition and 1.23, 95% CI 0.97–1.55, $p = 0.086$ for moderate malnutrition). Following covariate adjustment, these associations persisted (RoM 1.44, 95% CI 1.17–1.78 $p < 0.001$ for severe v. no/mild malnutrition; RoM 1.04, 95% CI 0.84–1.29, $p = 0.695$ for moderate malnutrition). **Conclusion:** Severe chronic malnutrition is prevalent in pediatric surgical patients and is independently associated with increased LOS after surgery, even after accounting for individual- and family-level confounders. Although some of this malnutrition may be related to the surgical condition, severe malnutrition may represent a modifiable social risk factor that could be targeted to improve postoperative outcomes and resource use.

Abdominal trauma outcomes at a tertiary hospital in Soroti, Uganda: a retrospective analysis. *Irena Zivkovic, Margaret Ajiko, Damian Duffy, Robert Baird.* From the Office of Pediatric Surgical Evaluation and Innovation, University of British Columbia, Vancouver, British Columbia, Canada (Zivkovic, Duffy); the BC Children's Hospital Department of Surgery, University of British Columbia, Vancouver, British Columbia, Canada (Zivkovic, Duffy, Baird); the Department of Surgery, Soroti Regional Referral Hospital, Soroti, Uganda (Ajiko); and the Division of Pediatric Surgery, University of British Columbia, Vancouver, British Columbia, Canada (Baird).

Background: This study aimed to determine the rate of negative laparotomy in trauma at the Soroti Regional Referral Hospital (SRRH) and the severity of injuries associated with abdominal trauma. **Methods:** Retrospective review of the SRRH trauma and operating room registries, and patient charts from Apr. 1, 2017, to June 1, 2018 for all patients admitted for abdominal trauma. Information collected included demographic, physiologic and course of care data. **Results:** There were 39 patients with complete data, of whom 18 were treated nonoperatively and 21 were treated operatively. Falls were the most frequent cause of injury in the operative group (52%); most falls (90%) were from mango trees. The proportion of male patients was higher in the operative group (81%) than in the nonoperative (39%) ($p = 0.01$). The operative group had lower imaging rates than the nonoperative group ($p = 0.0489$). The Injury Severity Score (ISS) was higher in the operative group (10.71) than in the nonoperative group (4.94) ($p = 0.005$). There were 17 positive laparotomy procedures and 4 negative procedures (19%). The rate of potentially unnecessary operations was 38.1% (8/21), determined by means of the Shock Index to identify hemodynamic stability. **Conclusion:** This low- and middle-income centre had a high negative laparotomy rate. Patients treated operatively had significantly lower rates of imaging and higher ISS values than those managed nonoperatively. The rate of potentially unnecessary operations was 38.1%.

A systematic review of the global burden of congenital surgically disabling impairments. *Leen Makki, Sara Medina Kasasni, Elena Guadagno, Norgrove Penny, Dan Poenaru.* From McGill University, Montreal, Quebec, Canada (Makki, Guadagno, Poenaru); Sherbrooke University, Sherbrooke, Quebec, Canada (Kasani); and the University of British Columbia, Vancouver, British Columbia, Canada (Penny).

Background: More than 1 billion people globally suffer from disabling impairments, 80% of whom are in low- and middle-income countries (LMICs), and a third of whom are children. Many conditions resulting in disabling impairments can be treated surgically. This systematic review aimed to identify the main surgically treatable congenital disabling impairments in LMICs and measure their burden. **Methods:** A senior medical librarian performed a systematic search within 7 databases for

publications related to pediatric surgical disabling impairments in LMICs, in all languages. We then excluded publications involving adults, from high-income countries, and of acquired, nonsurgical or nondisabling impairments, as determined by expert opinion. **Results:** Two reviewers independently screened the initial 2752 articles based on title and abstract. The systematic review resulted in a list of 12 definitively surgically treatable congenital surgical impairments, found within 100 publications, which were further corroborated with expert consultation. Another 11 potential conditions, cited in 163 publications, require further exploration. Table 2 presents the incidence, prevalence, disability weight and global disability-adjusted life years for the 12 definite conditions. **Conclusion:** Congenital surgical disabling impairments cause a substantial burden of disease globally. A clear identification of these surgically treatable conditions and of their impact can assist advocacy efforts for resource allocation in LMICs.

Clinical and microbiologic profile of chronic osteomyelitis among children in Western Uganda. *Tayebrwa Edson, Connor J. Peck, Adrienne Socci, Joel Bazira, Daniel K. Kisitu.* From the Department of Surgery, Mbarara University of Science and Technology, Mbarara, Uganda (Edson, Kisitu); the Yale School of Medicine, New Haven, Connecticut, USA (Peck); the Department of Orthopedics and Rehabilitation, Yale School of Medicine, New Haven, Connecticut, USA (Socci); and the Department of Microbiology, Mbarara University of Science and Technology, Mbarara, Uganda (Bazira).

Background: Chronic osteomyelitis (COM) is a major clinical problem in Uganda. This study characterizes the clinical and microbiologic profile of COM in children attending orthopedic services at a hospital in Western Uganda. **Methods:** Children presenting with COM at the Mbarara Regional Referral Hospital from October to June 2017 were included in the study. Pertinent clinical and radiologic features for each case were recorded. Superficial sinus or intraoperative pus swabs were taken for each sample and analyzed, with assessment of drug resistance. **Results:** A total of 74 children (9.7% of all pediatric orthopedic patients) met the inclusion criteria for COM during the study period. The average duration of symptoms before admission was 52 weeks, with 27.0%

Table 2. Incidence, prevalence, disability weight and global disability-adjusted life years for the 12 definitively surgically treatable congenital disabling impairments

Condition	No. of publications	Incidence (per 10 000 live births)	Prevalence (per 1000 population)	Disability weight	Disability-adjusted life years globally
Anorectal malformation	4	2	0.2	0.28–0.85	—
Hirschsprung disease	1	—	—	0.72	—
Undescended testis	3	1.5	—	0.22	—
Hypospadias	3	30	0.9	0.12	—
Bladder exstrophy	2	0.33	0.2	0.92	—
Cleft lip and/or palate	7	1.38	0.4	0.231–0.44	190 910–456 625
Spina bifida	10	70	—	0.593	3 854 000–10 918 000
Encephalocele	1	—	0.4	0.6	—
Cardiac anomaly	2	0.807–0.82	10–12	—	23 222 000–30 340 000
Clubfoot	5	12.4	2.9	0.1	—
Cataract	5	20 000–40 000 worldwide (per year)	0.4–2.0	0.6	—
Total congenital anomalies	—	—	—	—	50 550 000–66 265 000

of patients experiencing symptoms for longer than 2 years and 12.2% having infection of multiple bones. The most common presenting complaints of COM were chronic bone pain (92.0%) and discharging sinus (80.0%), and radiologic features typically included sequestrum (85.0%) and involucrum (80.0%). The tibia (37.8%) and femur (32.4%) were the most commonly affected bones. *Staphylococcus aureus* was the causative agent in 85% of cases. These isolates showed high levels of resistance to penicillin G (100%), Septrin (96.4%) and tetracycline (87.3%), and low resistance to gentamicin (0%), imipenem (7.8%) and ciprofloxacin (11.1%). Gram-negative isolates also showed full sensitivity to gentamicin but were highly resistant to Septrin, ampicillin and tetracycline. **Conclusion:** Our results demonstrate the large burden of COM and indicate a need for earlier recognition and treatment of COM, as well as improved and culture-guided patterns of antibiotic prescription.

The contribution of pediatric surgery to poverty trajectories in Somaliland. *Emily R. Smith, Tessa L. Concepcion, Mubarak Mohamed, Shukri Dabir, Edna Adan Ismail, Henry E. Rice, Anirudh Krishna, on behalf of the Global Initiative for Children's Surgery.* From the Duke Global Health Institute, Duke University, Durham, North Carolina, USA (Smith, Concepcion, Rice); the Department of Public Health, Robbins College of Health and Human Services, Baylor University, Waco, Texas, USA (Smith); the Edna Adan University Hospital, Hargeisa, Somaliland (Mohamed, Dahir, Ismail); and the Sanford School of Public Policy, Duke University, Durham, North Carolina, USA (Krishna).

Background: The provision of health care in low- and middle-income countries (LMICs) is recognized as a significant contributor to economic growth and also impacts individual families at a microeconomic level. The primary goal of our study was to examine the relationship between surgical conditions in children and the poverty trajectories of either falling into or coming out of poverty of families across Somaliland. **Methods:** This work used the Surgeons OverSeas Assessment of Surgical Need (SOSAS) tool, a validated cross-sectional household survey designed to determine the burden of surgical conditions within a community. We collected information on household demographic characteristics, including financial information, and surgical condition history of children younger than 16 years of age. To assess poverty trajectories over time, we measured household assets using the Stages of Progress framework. **Results:** We found there were substantial fluxes in poverty across Somaliland over the study period. We confirmed our study hypothesis and found that the presence of a surgical condition in a child itself, regardless of whether surgical care was provided, either reduced the chances of moving out of poverty or increased the chances of moving toward poverty. **Conclusion:** Our study shows that the presence of a surgical condition in a child is a strong singular predictor of poverty descent rather than upward mobility, which suggests that this stressor can limit the capacity of a family to improve its economic status. Our findings further support many existing macroeconomic and microeconomic analyses that surgical care in LMICs offers financial risk protection against impoverishment.

Validation of the "Lusaka formula," a novel weight-estimation formula in children presenting for surgery in a lower-middle-income country: a prospective, observational study. *Hope Phiri Nyimbili, Lowri Bowen, M. Dylan Bould.* From the University Teaching Hospital, Lusaka, Zambia (Phiri); The Noah's Ark Children's Hospital for Wales, Cardiff, UK (Bowen); the Children's Hospital of Eastern Ontario, Ottawa, Ontario, Canada (Bould); and the University of Ottawa, Ottawa, Ontario, Canada (Bould).

Background: Accurate weight determination is essential to avoid dosing errors. Where weighing is not feasible, age- or length-based formulae are used to estimate weight. Formulae must be validated in the local population, as most are derived from high-income countries, where childhood obesity is increasing. **Methods:** The "Lusaka formula" (weight = [age in months/2] + 3.5 if < 1 yr; weight = 2 × [age in years] + 7 if ≥ 1 yr) was derived from a previously published study. We aimed to validate this formula in a new data set. Weights, heights and age of 330 children were measured before surgery. Accuracy was examined by comparing the mean percentage error and the percentage of actual weights that fell between 10% and 20% of the estimated weight for the Lusaka formula and other existing formulae. **Results:** The Lusaka formula had a mean percentage error of 1.37% (95% confidence interval 0.9–0.1) and estimated weights to within 10% of actual weight 48.5% of the time. It had a slight tendency to underestimate weights. Its precision was comparable to that of the Broselow tape. Maternal education level significantly predicted weight for children older than 1 year. Of the 163 children aged 5 years or less, 17.8% were malnourished: 3.1% had extreme malnutrition, 3.1% had severe malnutrition and 11.7% had moderate malnutrition. **Conclusion:** The Lusaka formula is superior to previously published weight-estimating formulae in children presenting for surgery at the University Teaching Hospital in Lusaka, Zambia. Newer formulae significantly overestimated weights of the children in this population.

Trauma registry implementation: understanding trauma in Western Kenya. *Jessica Hogan, Thomas Churchill, Sandy Widder, Don Voaklander, Connie Keung, Emmy Rutto, Eunice Chepkemoi, Helen Wu Li, Kyle Carpenter, Joshua Kisorio.* From the University of Alberta, Edmonton, Alberta, Canada (Hogan, Churchill, Widder, Voaklander); Indiana University, Bloomington, Indiana, USA (Keung, Li); and the Moi Teaching and Referral Hospital, Eldoret, Kenya (Rutto, Chepkemoi, Carpenter, Kisorio).

Background: Over 90% of the 5 million trauma-related deaths worldwide each year occur in low- and middle-income countries such as Kenya; however, there is no national trauma registry to quantify injury incidence, which hinders public policy development and quality-improvement programming. We aimed to implement a trauma registry form in Western Kenya as part of an injury surveillance study. **Methods:** A customized trauma registry data collection form was developed and implemented at the Moi Teaching and Referral Hospital. A retrospective chart review assessed baseline data collection practices over a 7-month period ($n = 354$). Data for patients with trauma were collected prospectively ($n = 1918$) to understand whether a standardized

form would capture more meaningful and complete data. Prospective data were then analyzed for trends. **Results:** Males accounted for 80% of all patients ($n = 1520$). Injuries occurred primarily on public streets (932 [52%]) or in the home (595 [33%]). Care was provided by the hospital within 1 hour of injury in 270 cases (29%). Over 40% ($n = 773$) of patients sought care before arriving, and only 1% ($n = 20$) used formal ambulance services. Traffic incidents were the main cause of injury (789 [41%]), and the overall mortality rate was 15% ($n = 279$). **Conclusion:** The number of trauma cases captured in the data system increased more than fivefold with the use of our standardized trauma form. The data provided important insight that could inform decisions in the Kenyan health care system regarding resource utilization, patient care and outcomes.

Analysis of maternal mortality cases in a tertiary teaching hospital in Rwanda. *Herondine Uwajeneza, David Ntirushwa.* From the University of Rwanda, Kigali, Rwanda.

Background: Rwanda is 1 of only 9 countries that has achieved the Millennium Development Goal 5, and reducing maternal mortality remains a priority of the country. An analysis of all cases of maternal mortality in the biggest referral and teaching hospital in Rwanda was conducted to guide evidence-based interventions. This study aimed to analyze causes and circumstances of maternal death in the University Teaching Hospital of Kigali (CHUK) from January 2014 to June 2017. **Methods:** This was a retrospective study. All cases of maternal death were extracted using hospital records and patient files and analyzed with SPSS. **Results:** A total of 140 cases of maternal death were analyzed. Most cases occurred in the postpartum period (116 [82.9%]), compared to 24 (17.1%) in the antepartum period. Sepsis (57 cases [40.7%]) and postpartum hemorrhage (PPH) (28 cases [20.0%]) were the top 2 causes of maternal death, followed by hypertensive disorders (24 cases [17.1%]). Cesarean delivery was found to be the most predisposing factor and accounted for 75.8% of all cases of maternal death that occurred post partum. Of the 57 women who died post partum from sepsis, 91.2% had a cesarean delivery, as did 53.7% of those who died from PPH. Almost all the cases were referrals in the postpartum period from other health facilities, and the duration of stay at CHUK was short, with the majority of women (75.7%) dying in less than 5 days. **Conclusion:** Losing life while giving birth is an unacceptable scenario, especially in low- and middle-income countries. Strategies to ensure quality during cesarean delivery are needed, as this life-saving intervention can turn into a life-ending intervention if all conditions are not optimal.

Ethical framework for global humanitarian surgical missions. *Anna Schoenbrunner, Matthew Chetta.* From the Department of Plastic and Reconstructive Surgery, Ohio State University, Columbus, Ohio, USA.

Background: Global surgery is an essential component of a comprehensive global health plan. While there is potential to effect significant good, there is also potential to do harm. Herein we consider ethical dilemmas faced by surgeons from high-income countries (HICs) providing surgical services in lower- and middle-income countries (LMICs) and propose an ethical framework. These ethical dilemmas stem largely from power

imbalances between surgeons providing free or reduced-cost care to a vulnerable patient population. **Methods:** We draw on the 4 principles of medical ethics as a guide for HIC surgeons practising in LMICs. These principles are autonomy, beneficence, nonmaleficence and justice. **Results:** In regard to autonomy, patients must provide informed consent for the treatment they receive; power imbalances call into question whether informed consent is truly voluntary. The tension between beneficence and nonmaleficence raises the question of scope of practice; surgeons operating outside their scope may cause substantial harm. Last, in regard to justice, surgeons must consider what impact their work has on local and regional health care systems. In a system with limited resources, foreign surgeons can impair the ability of local surgeons to provide surgical services to those with acute needs, as operating rooms may be used by foreign surgeons performing elective surgeries. **Conclusion:** Global surgery has unique ethical challenges that surgeons must consider if they are to provide high-quality care to vulnerable populations. Shifting the focus toward capacity building will empower local communities and address many of the ethical dilemmas faced by HIC surgeons who practise globally.

An ethical framework for international socioeconomic-development partnerships in surgical innovation. *Shivani Mitra, Isaac Wasserman, Vatsbalan Santhirapala, Alexander W. Peters, Jesudian Gnanaraj, Praveen Ganesh, Salim Afshar.* From the Department of Plastic and Oral Surgery, Boston Children's Hospital, Harvard Medical School, Boston, Massachusetts, USA (Mitra, Wasserman, Santhirapala, Peters, Afshar); the Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA (Wasserman, Santhirapala, Peters, Afshar); the Icahn School of Medicine at Mount Sinai, New York, New York, USA (Wasserman); the Chelsea and Westminster Hospital, London, UK (Santhirapala); the Department of Surgery, Weill Cornell Medical Center, New York, New York, USA (Peters); the Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India (Gnanaraj); and the Department of Plastic Surgery, Saveetha Medical College, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India (Ganesh).

Background: In order to meet the Lancet Commission on Global Surgery (LCoGS) targets by 2030, a rapid and extensive investment in health infrastructure is required. This has led to a number of public/private and academic partnerships between high-income and low- and middle-income countries on pursuing surgical innovation and entrepreneurship. The disparities in funding, academic hierarchy and access to innovation science can lead to potentially exploitative relationships. **Methods:** Cognizant of this problem, the Program in Global Surgery and Social Change at Harvard Medical School, in collaboration with the Karunya Institute of Technology and Sciences and the Saveetha Institute of Medical and Technical Sciences in India, has developed an ethical framework for managing international development partnerships for surgical innovation. We outline the steps and precautions taken when promoting ethical innovation in low-resource settings. **Results:** Following a stakeholder meeting, our framework was built with the use of 3 main components: an underlying ethos, 4 guiding principles

and essential actions, as described in Fig. 3. Our model is founded on a shared ethical perspective, which leads to a series of tangible outcomes and ensures that collaborators engage in the practical application of ethical innovation. **Conclusion:** This abstract provides a replicable framework for building surgical innovation partnerships in an ethical manner. The framework empowers development partners to request certain safeguards before collaborating and highlights the need to adopt ethical practices in a systematic fashion. Through the adoption of this framework, a sustainable partnership is developed, producing synergistic benefits for collaborators as they codevelop surgical innovation.

Cheaper local outreach surgical service in Ghana: patient experience and outcomes of the locally organized Apridec Medical Outreach Group. *Stephen Tabiri, Frank E. Gyamfi.* From the Tamale Teaching Hospital, Tamale, Ghana (Tabiri); and the School of Medicine and Health Science, University for Development Studies, Tamale, Ghana (Gyamfi).

Background: Five billion people lack access to safe, affordable surgical and anesthesia care. Humanitarian efforts strive to fulfill unmet needs, but published mortality rates ranging from 1% to 3.3% highlight poor-quality care that should be unacceptable to providers and patients alike. The Apridec Medical Outreach Group (AMOG) is a Ghanaian-based non-governmental organization providing surgical outreach since 2010. We aimed to assess the safety and impact of the AMOG using outcomes data and quality of life (QoL) metrics. **Methods:** During the December 2017 outreach to the Upper East Region, we partnered with local clinicians to collect 15- and 30-day postoperative (POD) outcomes data

along with QoL metrics using the validated EQ-5D-5L tool. **Results:** In December 2017, 136 cases were performed. Complications included surgical site infections (SSIs) (11%), hematoma (5%), cardiac complication (1%) and urinary tract infections (1%). No deaths occurred. Patients reported a mean combined QoL index of 1.4 before surgery. On POD 15, this had worsened to 1.7, but then fell to 1.2 by POD 30 ($p < 0.01$). Before surgery, patients rated their overall health as 68/100. This rose to 75 on POD 15 and then 88 on POD 30 ($p < 0.01$). **Conclusion:** The SSI rate was similar to other published rates in low-resourced settings. It highlights an area for improvement. Patient QoL showed improvement across multiple domains, demonstrating profound impact on patients.

Laparoscopic cholecystectomy outcomes: a comparison between public community hospitals in South Africa and Canada. *Lindsay Delmar, Helen Janse van Rensburg, Brenden van der Westhuizen, Mark Hampton.* From the University of Alberta, Edmonton, Alberta, Canada (Delmar, van der Westhuizen); and the University of Cape Town, Cape Town, South Africa (Rensburg, Hampton).

Background: South Africa has a rich history of medical and surgical advancements, but at present there is no formal laparoscopic training curriculum for surgical trainees in the country. Laparoscopic skills are, rather, gained through experience. Comparatively, formal laparoscopic training is an integral component of Canadian surgical residency programs. In partnership with surgical staff affiliated with the University of Cape Town, we designed a study to evaluate any differences with regard to laparoscopic cholecystectomy outcomes. We were specifically interested in the rate of conversion to open procedure, average

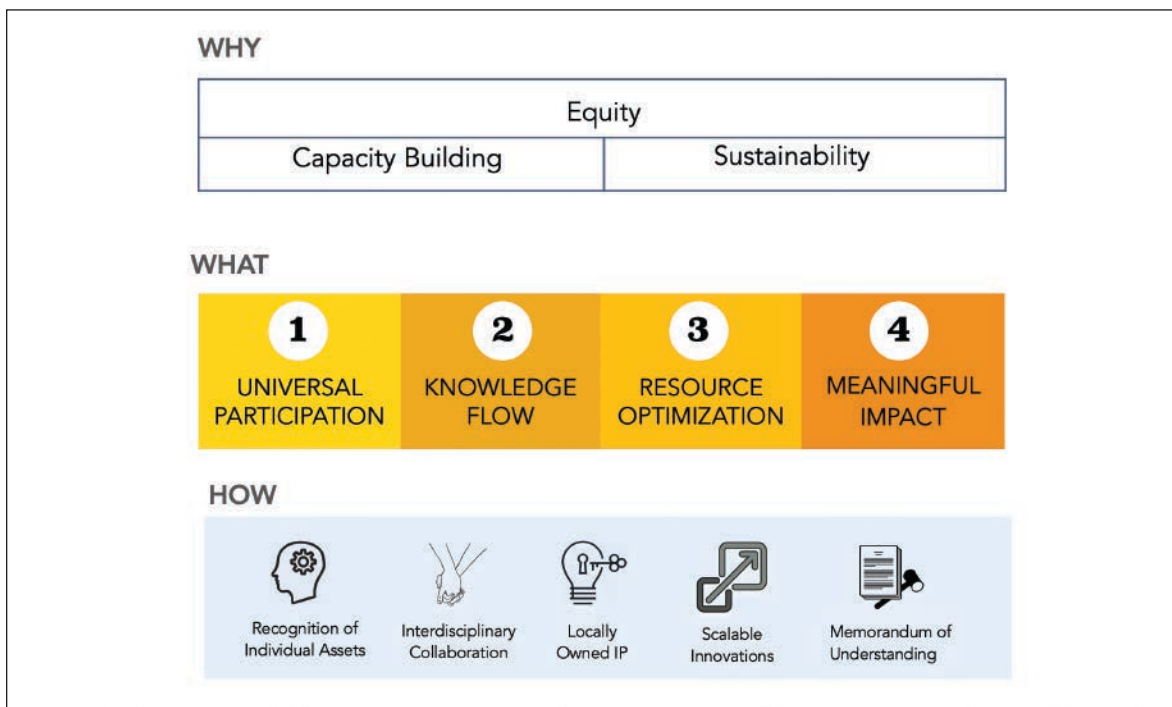


Fig. 3. An ethical framework for international socioeconomic-development partnerships in surgical innovation

surgical procedure time, rate of complications and length of hospital stay. **Methods:** Ethical approval was obtained, and the data were deidentified to protect patient privacy and confidentiality. Patients charts and operative data from 2015–2016 were reviewed retrospectively, coded, analyzed and compared with data collected from a similar-sized community hospital in Edmonton. The final sample size was 210. **Results:** Preliminary results showed a rate of conversion to open laparoscopy of 9.5% (20/210) and average procedure time of 97 minutes in the Cape Town sample. Available operative data from the Edmonton sample showed a conversion rate of 1.4% ($n = 1400$). More results will follow. **Conclusion:** Initial assessment showed trends that suggest a difference in outcome between the international sample groups. The results of this study could help justify the progression toward implementing a formalized minimally invasive training program for South African surgical trainees and likely lower conversion rates and health care costs. This study may also promote discussion surrounding the ethics of sharing training resources or assisting developing countries to initiate new programs.

Indications for limb amputation in humanitarian surgery: a descriptive study from Médecins Sans Frontières. Priyanka Naidu, Lynette Dominguez, Miguel Trelles, Kathryn Chu. From the University of Cape Town, Cape Town, South Africa (Naidu, Chu); and the Médecins Sans Frontières Operational Centre, Brussels, Belgium (Dominguez, Trelles).

Background: Limb amputations (LAs) are a common surgical procedure worldwide and are usually a result of diabetes,

atherosclerosis, infections or traumatic injury. Médecins Sans Frontières (MSF) provides surgical care in areas of conflict (CON), natural disaster (ND) or other settings with poor surgical systems (PSS). The objectives of this study were to describe indications for LAs and their associated risk factors in the humanitarian setting. **Methods:** Data from the MSF Operational Centre Brussels from Jan. 1, 2008, to Dec. 31, 2017 were analyzed. Surgical sites that performed LA were classified into CON, ND and PSS. Limb amputations were classified into emergency and non-emergency procedures. **Results:** There were 1621 LAs in 1188 patients from 17 countries. Of the 1188 patients, 73% were males, and the median age was 30 years. Trauma was the most common indication for LA (1219 [75%]), with 51% ($n = 826$) from unintentional trauma (Fig. 4). Infection accounted for 18% ($n = 289$). On multivariate analysis, age less than 30 years (odds ratio [OR] 2.83, $p < 0.001$), male gender (OR 2.23, $p < 0.001$), CON setting (OR 3.98, $p < 0.001$) and emergency procedure (OR 5.6, $p < 0.001$) were associated with intentional trauma. Areas of conflict were less likely to be associated with unintentional trauma (OR 0.67, $p > 0.001$). Age 30 years or more (OR 3.09, $p < 0.001$), female gender (OR 2.09, $p < 0.001$) and non-emergency procedure (OR 4.53, $p < 0.001$) were associated with infectious indications. **Conclusion:** Noncommunicable diseases such as diabetes and atherosclerosis are the most common indications for LA in high-income countries and are becoming more common in stable low- to middle-income countries. However, the humanitarian sector is still mainly addressing intentional and unintentional traumatic injuries among vulnerable populations.

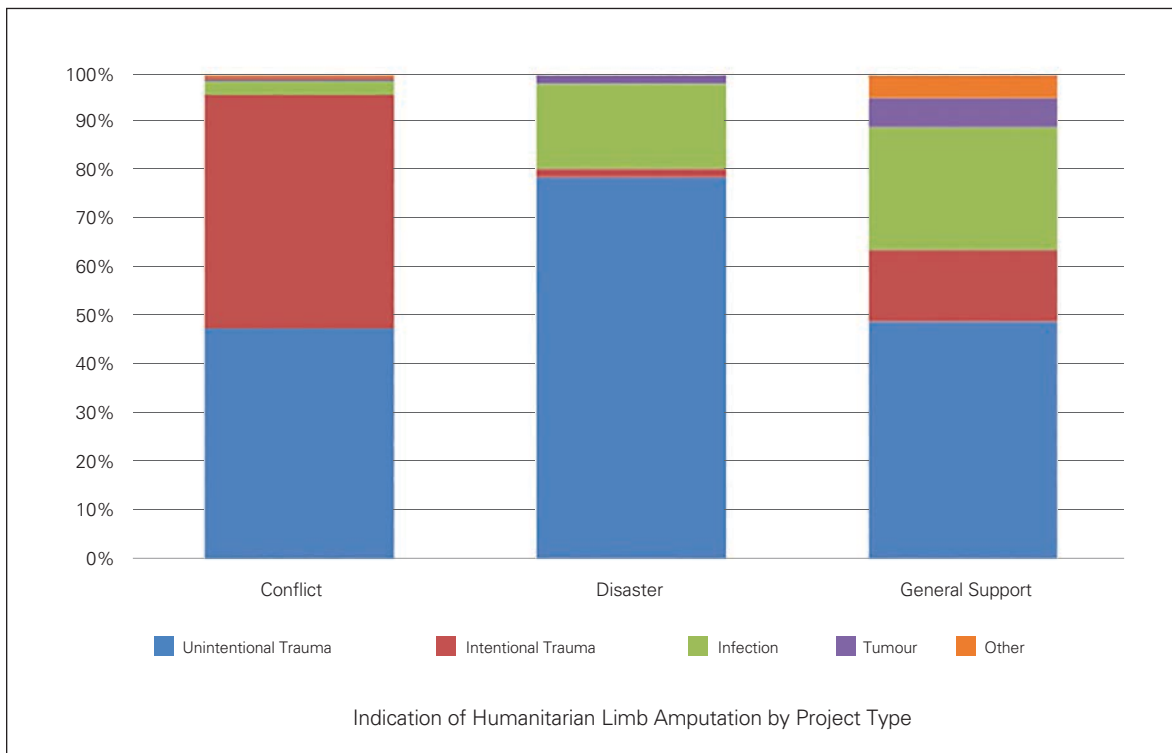


Fig. 4. Indication for humanitarian limb amputation by project type.

Management and outcomes following surgery for gastrointestinal typhoid: an international multicentre prospective cohort study. *Frank Gyamfi, GlobalSurg Collaborative.* From the School of Medicine and Health Science, University for Development Studies, Tamale, Ghana.

Background: Gastrointestinal (GI) perforation is the most serious complication of typhoid fever, with a high disease burden in low-income countries. Reliable prospective, contemporary surgical outcome data are scarce in these settings. This study aimed to investigate surgical outcomes following surgery for intestinal typhoid. **Methods:** Two international multicentre prospective cohort studies of consecutive patients undergoing surgery for GI typhoid perforation were conducted. Outcomes were measured at 30 days and included mortality, surgical site infection, organ space infection and reintervention rate. Multilevel logistic regression models were used to adjust for clinically plausible explanatory variables. Effect estimates are expressed as odds ratios (ORs) alongside their corresponding 95% confidence intervals (CIs). **Results:** A total of 88 patients across the GlobalSurg 1 and GlobalSurg 2 studies were included, from 11 countries. The 30-day mortality rate was 9.1% (8/88) and was higher in children (14.7% v. 5.6%). Surgical site infection was common, at 67.0% (59/88). Organ site infection was common, with 10.2% of patients affected. An American Society of Anesthesiologists grade of III or above was a strong predictor of 30-day postoperative mortality, at the univariable level and following adjustment for explanatory variables (OR 15.82, 95% CI 1.53–163.57, $p = 0.021$). **Conclusion:** Outcomes from surgery for intestinal typhoid remain poor. Future studies in this area should focus on sustainable interventions that can reduce perioperative morbidity. At a policy level, improving these outcomes will require both surgical and public health system advances.

Successful academic collaborations in global health: a systematic review. *Alexander D. Morzycki, Regan Guilfoyle, Abdullah Saleh.* From the Division of Plastic Surgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada (Morzycki, Guilfoyle); and the Division of Pediatric General Surgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada (Saleh).

Background: The academic surgical community is increasingly involved in global health efforts to address the overwhelming burden of surgical disease in low-income countries. There is little research dedicated to understanding the best approach to creating a successful and sustainable global health project. Our objective was to review the shared characteristics of successful academic health care partnerships between high- and low-income countries. **Methods:** Two independent reviewers conducted a systematic search using Ovid MEDLINE, Ovid Embase, Ovid Global Health, Cochrane Library, EBSCO CINAHL, Scopus and Web of Science Core Collection. Articles describing a collaborative academic partnership between high- and low-income countries between 1910 and September 2018 were included. **Results:** The majority of collaborations were initiated by either the host institution or as a joint decision between institutions. The primary goal of these collaborations revolved around medical education/training and curriculum

development. Two partnerships, after more than a decade of collaboration, had achieved a self-sustaining program. Lack of funding was identified as a major barrier to sustainability. **Conclusion:** Successful academic partnerships require true collaboration and equal participation of all partners. Funding should be secured before program development in anticipation of a minimum 10-year project. A minimum list of guidelines has been proposed to improve the chances of both a successful and a sustainable collaboration.

Generating Recruiters for randomized trials in surgery (GRANULE): improving quality of research consent through a structured 1-day training course. *James Glasbey, NIHR Unit on Global Surgery.* From the NIHR Global Health Research Unit on Global Surgery, University of Birmingham, Birmingham, UK.

Background: Surgical trials are complex and often fail to reach recruitment targets. High-quality, pragmatic clinical trials are required to improve the evidence base for safe surgery around the world. The Generating Recruiters for randomized trials in surgery (GRANULE) course aims to provide training for researchers to take informed consent for patient participation in trials. **Methods:** An immersive 1-day course (GRANULE) was designed with support from 2 registered clinical trials units (National Institute for Health Research [NIHR] Global Health Research Unit on Global Surgery and Bristol Medical Research Council ConDuCT-II hub). All delegates were encouraged to complete Good Clinical Practice certification before registration. Content was supported by an open-access online NIHR Learn module: learn.nihr.ac.uk/GRANULE describes a 5-step framework: 1) normalizing the research process, 2) conveying clinical equipoise, 3) balancing benefits and harms, 4) process and purpose of randomization and 5) addressing patient preferences. Simulated patient interactions allowed delegates to apply techniques in real time. Training-the-trainers content was provided to allow delegates to disseminate GRANULE content back to their local teams of investigators. **Results:** Over 200 delegates have completed the GRANULE course. It has been delivered as a full-day course in the United Kingdom (2015–2019), Europe (2017–2019) and sub-Saharan Africa (Kigali, 2018). Abridged 1-hour GRANULE introductory courses have been delivered over 20 times to both undergraduate and postgraduate trainees and are embedded within site initiation visits for several international randomized trials. Feedback has demonstrated a need for training in trial recruitment and improved confidence and competence following course completion. **Conclusion:** The GRANULE course is open-access and available for use by clinical trialists to improve recruitment and informed consent.

Needs assessment of rural providers for the development of a pediatric emergency surgical care course in Uganda. *Nensi M. Ruzgar, Maija Cheung, Sarah Ullrich, Phyllis Kisa, Doruk Ozgediz.* From the Yale University School of Medicine, New Haven, Connecticut, USA (Ruzgar); the Department of Surgery, Yale University School of Medicine, New Haven, Connecticut, USA (Cheung, Ullrich, Ozgediz); and the Department of Surgery, Makerere University, Mulago Hospital, Kampala, Uganda (Kisa).

Background: Challenges faced by global pediatric surgery (PS) are especially prevalent in Uganda, where only 4 pediatric surgeons and 3 pediatric anesthesiologists care for over 20 million children, with limited low-cost and setting-appropriate training opportunities available to enhance PS capacity. In 2018, a Pediatric Emergency Surgical Care course was developed for providers at rural Ugandan hospitals. We assessed the needs expressed by participants to guide future PS curriculum design. **Methods:** Rural Ugandan providers were recruited to attend a pilot course in Kampala. Participants completed a postcourse knowledge test, and pre- and postcourse surveys. The precourse survey covered participants' training, common conditions treated at the home institution or referred to higher levels of care, and capacity-related priorities. **Results:** Eleven providers attended the course, including 7 medical officers, 3 surgeons and 1 senior house officer. Sixty percent completed their training within the last year, and only 40% had any prior PS exposure, with an average exposure of 7.5 weeks. The most common PS procedures performed or referred correlated with the providers' confidence in managing those conditions. The providers rated the most-needed interventions as more frequent continuing medical education courses (35%), hands-on training (27%) and improved anesthesia (21%). The postcourse test had a median correct score of 86%, and the postcourse feedback highlighted the need for similar training opportunities, hands-on demonstrations, and extensions of similar courses to more senior providers, nurses and anesthesia providers. **Conclusion:** The gaps and priorities identified by providers from rural Ugandan hospitals suggest the need for more frequent, hands-on, multidisciplinary training opportunities to enhance PS capacity.

ATLS protocol adherence is low among Brazilian providers of pediatric trauma care. *F.M. Botelho-Filho, P. Truche, L. Caddell, D. Mooney, N. Alonso, S.C.V. Abib.* From the Hospital das Clínicas da Universidade Federal de Minas Gerais, Belo Horizonte, Brazil (Botelho-Filho); the Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA (Truche, Caddell); the Boston Children's Hospital, Harvard Medical School, Boston, Massachusetts, USA (Mooney); the Hospital das Clínicas da Universidade de São Paulo, São Paulo, Brazil (Alonso); and the Escola Paulista de Medicina, Universidade Federal de São Paulo, São Paulo, Brazil (Abib).

Background: Trauma is a leading cause of morbidity and mortality for children. Efforts toward improving trauma care have included advocacy for Advanced Trauma Life Support (ATLS) certification; however, the effectiveness of ATLS has not been evaluated. This study sought to determine the adherence to ATLS protocols during trauma assessment at a trauma centre in Brazil. **Methods:** Trauma assessments for pediatric patients (age < 14 yr) presenting to a level 1 trauma centre in Belo Horizonte were prospectively observed over 6 months. Completion of each step of ATLS protocols was documented, and the proportions of completed steps were compared between pediatricians, general surgery residents and trauma surgeons. **Results:** Assessments of 64 patients with major trauma were observed ($n = 62$). None of the physicians com-

pleted all expected ATLS steps. The average proportion of ATLS steps completed was 33%, with no difference between the specialties ($p = 0.821$). Trauma surgeons did the first assessment in 32 patients in this study. They achieved 33.3% of the steps, the same as general surgery residents ($n = 22$) and pediatricians ($n = 10$). Steps most commonly missed were protection of the cervical spine and administering oxygen (performed in 12.5%), measuring the breathing rate (17.2%), exposing the patient and protecting from hypothermia (18.8%). In contrast, the most commonly performed step was calculating the Glasgow Coma Scale, performed in 95%. The focused assessment with sonography for trauma (FAST) examination was performed in 15 patients (23%). **Conclusion:** Advanced Trauma Life Support training alone may not ensure quality pediatric trauma care. Furthermore, there were no significant differences between the specialties, including surgical trainees. More research is needed to determine ways to improve pediatric trauma care.

Orthopedic trauma and triage: a retrospective analysis in rural Uganda. *Connor J. Peck, Dan K. Kisitu, Kristin Yu, Taylor Ottesen, Adrienne R. Succi.* From the Yale School of Medicine, New Haven, Connecticut, USA (Peck, Ottesen, Yu); the Mbarara University of Science and Technology, Mbarara, Uganda (Kisitu); and the Department of Orthopedics and Rehabilitation, Yale School of Medicine, New Haven, Connecticut, USA (Succi).

Background: Traumatic injury accounts for 11% of the global burden of disease and disproportionately affects low- and middle-income countries (LMICs). This study characterized patterns of triage and the incidence of orthopedic trauma and musculoskeletal (MSK) conditions seen at a referral hospital in western Uganda. **Methods:** A 6-month retrospective review of orthopedic emergency, outpatient and surgical cases at the Mbarara Regional Referral Hospital was performed in July 2018. **Results:** During the study period, 134 orthopedic surgery procedures were performed. Fracture reduction and fixation accounted for 70.9% of operations, with the femur being the most common site of fracture (26.8% of surgical caseload). Osteomyelitis was the next-leading cause for operation (9.7% of the caseload), followed by implant removal and refurbishing (8.2%), neoplasm (6.0%) and open débridement (2.2%). Operative patients were predominantly male (64.3%) with mean age of 34.9 (standard deviation 18.5) years. The majority of fractures were treated nonoperatively, such that only 31.9% of femoral, 13.8% of tibial and fibular, 9.4% of humeral, and 6.7% of radial and ulnar fractures were managed surgically. Outpatient MSK conditions were also treated conservatively; despite constituting 28.4% and 8.8% of the outpatient caseload, patients with back pain and arthritis, respectively, were not treated operatively. Care providers' self-reported barriers included limited resources, imaging and training. **Conclusion:** Orthopedic surgical care at a major Ugandan referral hospital is currently limited to traumatic fracture repair and osteomyelitis management. Even among these patients, rates of operation are low. These findings reflect infrastructure and specialized workforce limitations hindering comprehensive orthopedic care in western Uganda.

Mesh versus suture repair of primary inguinal hernia in Ghana. *S. Tabiri, F. Owusu, F. Atindaana Abantanga, A. Moten, D. Nepogodiev, O. Omar, A. Bhangu.* From the School of Medicine and Health Sciences, University for Development Studies, Tamale, Ghana (Tabiri, Atindaana Abantanga); the Tamale Teaching Hospital, Tamale, Ghana (Tabiri, Atindaana Abantanga); St. Patrick Hospital, Offinso, Ghana (Owusu); the Department of Surgery, Temple University Hospital, Philadelphia, Pennsylvania, USA (Moten); and the National Institute for Health Research Global Health Research Unit on Global Surgery, Institute of Translational Medicine, University of Birmingham, Birmingham, UK (Nepogodiev, Omar, Bhangu).

Background: Most patients in Ghana undergo suture repair for primary inguinal hernia. Although there is strong evidence from high-income country settings to indicate superiority of mesh repair for inguinal hernia, the evidence to support the safety and effectiveness of mesh repair in the Ghanaian setting is limited. This study aimed to compare hernia recurrence rates following suture versus mesh repair in Ghana. **Methods:** Men aged 18 years or more presenting with symptomatic reducible inguinal hernias were included. Over the first 6 months, all consecutive patients were enrolled prospectively and underwent standardized suture repair; an equal number of patients were subsequently enrolled to undergo mesh repair. The primary outcome was hernia recurrence within 3 years of the index operation. Multivariable analysis was adjusted for age and right or left side. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) are reported. **Results:** A total of 116 sutured and 116 mesh inguinal hernia repairs were performed. Three years after surgery, follow-up data were available for 206 (88.8%) of the 232 patients. Recurrence occurred significantly more frequently in the suture repair group (23/103 [22.3%]) than in the mesh group (7/103 [6.8%]) ($p = 0.002$). In multivariable analysis, suture repair was independently associated with an increased risk of recurrence (OR 4.51, 95% CI 1.76–11.52; $p = 0.002$). **Conclusion:** In Ghana, mesh inguinal hernia repair was associated with reduced 3-year recurrence compared to sutured repair. Controlled dissemination across Ghana should now be assessed.

Provision of surgical care for children across Somaliland: challenges and policy guidance. *Mubarak Mohamed, Tessa Concepcion, Sbugri Dabir, Edna Adan Ismail, Dan Poenaru, Henry Rice, Emily R. Smith.* From the Edna Adan Maternity Hospital, Hargeisa, Somaliland (Mohamed, Dahir, Ismail); the Duke Global Health Institute, Duke University, Durham, North Carolina, USA (Concepcion, Rice, Smith); BethanyKids, Africa (Poenaru); the Department of Surgery, McGill University, Montreal, Quebec, Canada (Poenaru); the Division of Pediatric Surgery, Duke University, Durham, North Carolina, USA (Rice); and the Department of Public Health, Robbins College of Health and Human Sciences, Baylor University, Waco, Texas, USA (Smith).

Background: Existing data suggest a large burden of surgical conditions in low- and middle-income countries (LMICs). However, surgical care for children in LMICs remains poorly understood owing to lack of high-quality data. Our goal was to

define the hospital infrastructure, workforce and delivery of surgical care for children across Somaliland, and provide policy guidance to improve their care. **Methods:** We used 2 established hospital assessment tools to assess infrastructure, workforce and capacity at all hospitals providing surgical care for children across Somaliland. We also collected data on all surgical procedures performed in children in Somaliland between August 2016 and July 2017 using operative logbooks. **Results:** We collected data from 15 hospitals across the country, including 8 government, 5 for-profit and 2 charity hospitals. There were 0.6 surgical providers and 1.2 anesthesia providers per 100 000 population. A total of 1255 surgical procedures were performed in children in all hospitals over 1 year, equating to a rate of 62.4 surgical procedures annually per 100 000 children. Care was concentrated at private hospitals within urban areas, with only a limited number of procedures for many high-burden pediatric surgical conditions. **Conclusion:** We found a profound lack of surgical capacity for children in Somaliland, with care concentrated within urban areas and focused on a limited type of procedures. Hospital-level surgical infrastructure, workforce and care delivery are reflective of a severely resource constrained system. Targeted policy to improve essential surgical care at local, regional and national levels is essential to improve the health of children in Somaliland.

Obstetric admissions to intensive care unit of tertiary hospitals in Rwanda: prevalence and outcome. *Alcade Rudakemwa.* From the Department of Anesthesiology, Emergency and Critical Care Medicine, University of Rwanda, Kigali, Rwanda.

Background: Reasons for obstetric admission to the intensive care unit (ICU) vary from one setting to another and may depend on bed availability. Outcomes from the ICU and their prediction models are not well explored in Rwanda because of lack of appropriate scores. **Methods:** Data were prospectively collected for obstetric patients admitted to the 2 ICUs of public referral hospitals in Rwanda from Mar. 1, 2017, to Feb. 28, 2018 to identify reasons for admissions and factors affecting prognosis. **Results:** In total, 747 patients were admitted to the 2 ICUs, of whom 94 (12.6%) were admitted for obstetric reasons. These obstetric patients were drawn from 4999 patients who delivered in the 2 facilities, indicating that 1.9% of obstetric patients were admitted to the ICU. The most common reasons for admission to the ICU were sepsis (31.9%), peripartum hemorrhage (25.5%) and pregnancy-induced hypertension (17%). The mortality rate within the ICU for these obstetric patients was 54.3%, and the average length of stay was 6.6 days. When adjusted for reason for admission and cesarean delivery before admission, the Modified Early Obstetric Warning Score (MEOWS) was an independent predictor of mortality, with an adjusted odds ratio (OR) of 1.25 (95% confidence interval [CI] 1.07–1.46, $p = 0.005$). A 1-point increase of the quick Sequential Organ Failure Assessment increased the odds of ICU mortality by 181% (adjusted OR 2.81, 95% CI 1.25–6.30, $p = 0.012$). **Conclusion:** Sepsis is the most common reason for obstetric admission to the ICU, with high risk of mortality, in Rwanda. The MEOWS is a good tool for ICU mortality prediction for obstetric patients but needs to be explored in a larger study.

Developing a UK framework for ethical principles in global reconstructive surgery. *Barbara Jemec, Matt Fell, Sarah Tucker, Wee Lam.* From the British Foundation for International Reconstructive Surgery and Training (BFIRST), UK.

Background: There is undoubtedly a great need for global reconstructive surgery to address the inequalities in care provided to those with disability in low- and middle-income countries (LMICs). Humanitarian organizations have produced a plethora of guidance in recent years in an attempt to promote ethical practice in LMICs. The number of different standards can be confusing and do not facilitate practical working principles for global reconstructive surgeons working in the field. This project aimed to design practical ethical guidelines for global reconstructive surgery. **Methods:** The British Foundation for International Reconstruction Surgery and Training (BFIRST) performed a systematic review of global surgery guidance. Of note, the International Confederation of Plastic Surgery Societies and the Royal College of Surgeons of England had released guidance in 2017 and 2018, respectively. **Results:** Standards of practice were created to promote strong ethical principles in a way that could be practically interpreted in the field. The standards are designed to coincide with the 3 main project stages so that surgeons and health team can implement the guidance in a user-friendly way: 1) project design — emphasis on the direction of the project being guided by the local partner, 2) project implementation — emphasis on the delivery of education in a way that empowers the local team and 3) project impact and follow-up — emphasis on sustainability, equipment procurement, and mechanism of data storage and follow-up. **Conclusion:** The BFIRST has formulated ethical principles in global reconstructive surgery that are practically oriented and user-friendly.

Emergency obstetric care in the prehospital setting: the SAMU experience in Kigali, Rwanda. *A. Rosenberg, J. Nyinawankusi, R. Habibirwe, M. Dworkin, V. Nsengimana, E. Kankindi, M. Niyonsaba, J.M. Uwitonze, I. Kabagema, T. Dushime, S. Jayaraman.* From the Virginia Commonwealth University Department of Surgery, Richmond, Virginia, USA (Rosenberg, Jayaraman); the Service d'Aide Médicale Urgente, Rwanda Ministry of Health, Kigali, Rwanda (Nyinawankusi, Habibirwe, Kankindi, Niyonsaba, Uwitonze, Kabagema); Jefferson University, Philadelphia, Pennsylvania, USA (Dworkin); and the University Teaching Hospital of Kigali, Kigali, Rwanda (Nsengimana).

Background: In Rwanda, 69% of the population is less than 31 years of age, and 25% of the population is of child-bearing age. We sought to understand the care provided for obstetric emergencies in the prehospital setting by the Service d'Aide Médicale Urgente (SAMU), the public ambulance service in Rwanda. **Methods:** Descriptive analysis was performed of demographic, indication and intervention data for obstetric emergencies between December 2012 and May 2016 collected in a prospective database. **Results:** Nearly 16% of the 11 161 patients seen by the SAMU were for obstetric emergencies, which represented 38.7% of all women seen by the SAMU. The average age was 26 (standard deviation [SD] 9)

years. A total of 57% of cases were delivery-related: labour (75%) and retained placenta (19%). Pregnancy-related complications such as bleeding (22%) and threatened abortion (22%) accounted for a quarter of all obstetric calls, and 11% were postpartum problems including eclampsia and hemorrhage. Four percent had gynecological complaints including cervical cancer and metrorrhagia. Among 826 women in labour, the average degree of dilation was 5.5 cm (SD 3 cm). **Conclusion:** Obstetric emergencies need early recognition and intervention to support optimal outcomes for both mother and child. In Kigali, Rwanda, the SAMU prehospital service provides much-needed emergency obstetric care. Supporting their training in management of obstetric emergencies, ensuring supply chain of critical medications such as misoprostol and tranexamic acid, and optimizing rapid communication with receiving hospitals is likely to have a substantial impact on maternal and fetal outcomes in the country.

Cleft lip and palate procedures in the Democratic Republic of the Congo, 2007–2018: identifying an area of unmet need. *Luc Malemo, Sarab Cairo, Christine Weber, Tianyi Shao, Xiya Ma, Nadia Safa, Kathryn Larusso, Christian M. Salmon, David H. Rothstein, Dan Poenaru.* From HEAL Africa, Goma, North Kivu, Democratic Republic of the Congo (Malemo); Maine Medical Center, Portland, Maine, USA (Cairo); Queen's University, Kingston, Ontario, Canada (Weber); Western New England University, Springfield, Massachusetts, USA (Shao); the McGill University Health Centre, Montreal, Quebec, Canada (Malemo, Ma, Safa, Larusso, Poenaru); and the University at Buffalo, State University of New York, Buffalo, New York, USA (Salmon).

Background: Cleft lip and/or palate (CL-P) are common congenital anomalies, affecting approximately 2300 new children yearly in the Democratic Republic of the Congo (DRC). All cleft work in DRC is currently done through nongovernmental organizations (NGOs), but their ability to meet the need has not been evaluated. **Methods:** Records were reviewed for all patients who underwent surgery for CL-P by 2 large NGOs in DRC between April 2007 and October 2018. The median age at time of surgery (a proxy of surgical backlog) and numbers of CL-P procedures were recorded and analyzed. As CP interventions are more complex and resource-demanding, the ratio of CP/CL interventions performed was used as a proxy for resource availability. The total number of predicted cleft cases was estimated based on national data. **Results:** The study included 5355 patients who underwent surgery for CL-P. Despite an increase in the total number of procedures over time, no decrease in median age at surgery or proportion of patients who underwent only CL repair was observed. The estimated backlog of CL-P cases in 2018 was 11 000; moreover, only 28.5% of new cases of CL-P were treated. Although over 50% of patients with CL-P globally require CP repair, and 31.1% had CP in our series, only 23.2% of CP cases in this series were repaired. **Conclusion:** Despite efforts by international charities to address the CL-P burden in DRC, the unmet need remains substantial, and many patients are only partially treated. Further resources are needed to provide the appropriate and essential surgical interventions in DRC.

Evaluation of the impact for practitioners of Canadian Network for International Surgery (CNIS) structured clinical training in Tanga, Tanzania. *B. Evans, B. Mushi, W. Pollett, R. Lett.* From Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada (Evans, Pollett); and the Canadian Network for International Surgery, Vancouver, British Columbia, Canada (Mushi, Lett).

Background: Structured clinical training has been used by the Canadian Network for International Surgery in Tanga. Courses on obstetric and surgical care, including Essential Surgical Skills (ESS), Fundamental Interventions, Referral and Safe Transfer (FIRST) and Structured Operative Obstetrics (SOO), were delivered between 2012 and 2015. This study aimed to assess the effectiveness of structured clinical training in Tanga. **Methods:** We constructed a questionnaire to evaluate the impact of the ESS, FIRST and SOO courses at least 3 years after delivery of the courses. The survey was administered to 168 participants. Responses were collected and analyzed by means of SPSS. **Results:** The response rate for the survey was 18.5%. Respondents included 14 midwives, 16 assistant medical officers (50.0%), 1 physician and 1 assistant nurse officer. A total of 71% of the respondents were male. The mean age was 36.8 (standard deviation 8.3) years. The practice setting of respondents included district hospitals (50.0%), urban hospitals (28.1%) and rural health facilities (21.9%). About half (48.4%) of respondents had taken both ESS and SOO courses; the remainder had taken just 1 of the 3 courses. Almost all respondents (96.9%) agreed that the quality of obstetric and surgical care has improved in their local area, and 65% felt their ability to handle emergencies was improved. There was no difference in opinion based on the current role of the respondent or gender ($p = 0.514$ and 0.141 , respectively). The mean number of procedures taught in the courses was 20, and the mean number used in practice was 17. **Conclusion:** Structured clinical training, including ESS, FIRST and SOO courses, has been effective in Tanga.

Spatial analysis of traumatic injuries in Uganda using a hospital-based registry. *Ameer Farooq, Tessa Robinson, Marcia Castro, Martin Situma, Karen Bailey, Abdullah Saleh, Brian H. Cameron.* From the Department of Surgery, University of Calgary, Calgary, Alberta, Canada (Farooq); the Department of Surgery, McMaster University, Hamilton, Ontario, Canada (Robinson, Bailey, Cameron); the Department of Global Health and Population, the Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA (Castro); Mbarara Regional Referral Hospital, Mbarara, Uganda (Situma); and the Department of Surgery, University of Alberta, Edmonton, Alberta, Canada (Saleh).

Background: Traumatic injuries continue to be a major source of morbidity and mortality globally. Space plays a key role in trauma, both in the typology of injuries and the outcomes of traumatic injuries. This study aimed to analyze spatial patterns of trauma in Uganda. **Methods:** A hospital-based trauma registry at Mbarara Regional Referral Hospital (MRRH) in Mbarara, Uganda was instituted. Patient/injury location information was collected. Using ArcGIS, we georeferenced the locations of the injuries of patients who presented to MRRH between February 2017 and March 2018. Ordinary least-squares regression was

used to examine which characteristics were associated with in-hospital mortality and length of stay (LOS). A local and global Moran's I was calculated to examine for spatial patterning. Route analysis was performed to obtain the optimal road routes for trauma referrals. **Results:** This study showed that a hospital-based registry can be used to examine spatial patterns in trauma and regional trauma-referral patterns. We found that the majority of injuries in Mbarara continue to be road traffic incidents (897/1403 [64%]). There was a statistically significant increase in LOS for patients who had to travel more than 50 km to reach the hospital ($p < 0.05$) and a trend toward increased mortality. Route optimization showed that local hospitals are often bypassed in favour of MRRH. **Conclusion:** Spatial analysis is an important tool for analyzing trauma systems. Additional work should be done to develop real-time geographic information systems, which can help public health officials to better design trauma systems.

Assessment of postgraduate learning environment at the University of Nigeria Teaching Hospital using the Postgraduate Hospital Educational Environment Measure (PHEEM). *U.O. Ezomike, E.I. Udeb, E.I. Nwangwu, E.O. Ugwu, N.I. Nwosu, M.D. Ughasoro, N.E. Ezomike, S.O. Ekenze.* From the Sub-Department of Pediatric Surgery, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Ezomike, Nwangwu, Ekenze); the Department of Surgery, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Udeb); the Department of Obstetrics and Gynaecology, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Ugwu); the Department of Internal Medicine, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Nwosu); and the Department of Pediatrics, University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria (Ughasoro, Ezomike).

Background: A congenial learning environment is paramount to effective impartation and acquisition of knowledge and skills as required in residency training, a key instrument in ensuring adequacy of well-trained workforce for global surgery. Objective assessment of the strengths/weaknesses of such learning/teaching environment using the Postgraduate Hospital Educational Environment Measure (PHEEM), a 4-item validated questionnaire, will help health policy-makers to improve various aspects of the learning environment. This study aimed to assess the postgraduate learning environment at the University of Nigeria Teaching Hospital (UNTH) using PHEEM and assess whether there are any significant differences in scores among various subgroups of resident doctors. **Methods:** Printed forms of the validated questionnaire were distributed among junior and senior residents in surgery, pediatrics, internal medicine, and obstetrics and gynecology, and the data were entered into SPSS. The mean of each item score and total score were calculated. Analysis of variance was used to assess the significance of total scores and subscale scores among the different subgroups of sex, specialty and training grade. **Results:** A total of 160 residents responded: 114 men and 46 women; 93 registrars and 67 senior registrars. The overall PHEEM score was 85.82. The subscale scores were Role autonomy 29.27, Perception of teaching 34.80 and Perception of social support 21.55. Men scored higher than women in total PHEEM ($p = 0.000$, $F = 148.235$),

Perception of teaching ($p = 0.000$, $F = 420$) and Perception of social support ($p = 0.000$, $F = 162.95$) but not Role autonomy ($p = 0.748$, $F = 0.104$). Registrars scored more than senior registrars in total PHEEM ($p = 0.000$, $F = 67.159$), Role autonomy ($p = 0.000$, $F = 25.123$) and Perception of teaching ($p = 0.000$, $F = 18.042$) but not Perception of social support ($p = 0.31$, $F = 1.045$). **Conclusion:** The postgraduate learning environment at UNTH has more positives than negatives, but there is room for improvement. Men and junior registrars tend to accept the present environment more than women and senior registrars.

Surgical checklist usage at the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. *Kehinde Oluwadiya, Johnson Dare Ogunlusi, Moruf Babatunde Yusuf, Popoola Sunday Ogunsuyi, Obafemi K. Wuraola, Wabeed O. Babalola, Oduwale Olayemi Ajogbasil.* From the Department of Surgery, Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria (Oluwadiya, Ogunlusi, Yusuf, Ogunsuyi, Wuraola, Babalola); and the Department of Nursing, Perioperative Unit, Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria (Ajogbasil).

Background: The rate of perioperative death due to surgery has been estimated at 0.4%–0.8%, and the rate of major complications has been estimated at 3%–17%. The World Health Organization Surgical Checklist can potentially prevent errors that may contribute to these deaths and complications. This study aimed to ascertain awareness of the surgical checklist among operating theatre users and determine the barriers to its implementation. **Methods:** This was a prospective questionnaire-based study of surgeons, anesthetists and perioperative nurses at the Ekiti State University Teaching Hospital, Ado-Ekiti, operating theatre. **Results:** Of the 85 questionnaires distributed, 70 were returned, and 4 were discarded because they were not completely filled. There were 40 surgeons, 12 anesthesiologists and 14 perioperative nurses. Fifty-five respondents (83.3%) had awareness of the checklist, but only 12 (18.2%) correctly stated the main objective of the checklist, which is to ensure patients' safety and safe surgery. Major barriers to its use included lack of training (58.2%) and lack of assertiveness of staff (58.2%), and 47.2% felt it was causing unnecessary delays. **Conclusion:** The study demonstrated a high level of awareness of the surgical checklist in the hospital; however, this awareness contrasted with the theatre users' poor knowledge of the true aims of the checklist. Perhaps this explains why only 25% had previously used it in the hospital. The majority of the respondents would want to be trained on the use of the checklist despite the highlighted barriers.

Equitable public-private partnership to build an accessible surgical program at a rural community hospital in Chiapas, Mexico. *William Pavlis, Susana Samaniego, Valeria Macias.* From the *Compañeros en Salud*, Mexico (Pavlis, Macias); and the UCSF HEAL Fellowship (Samaniego).

Background: *Compañeros en Salud* (CES) provides primary health care and associated programs in the Sierra Madre of Chiapas, Mexico. A needs assessment of the Hospital Básico Comunitario Ángel Albino Corzo (HBCAAC) showed that the hospital referred 613 gynecological patients (49.2% of all referrals), 205 general surgery patients (16.5%) and 101 patients with

trauma (8.1%) in the 24 months before June 2018. A total of 91.3% of these patients were referred to hospitals requiring more than 2 hours of transport, which led to significant barriers to care. A medical records review from 2012 to 2014 showed that, of all patients requiring surgery in the region, only 47.3% were able to obtain services. Through an equitable partnership based on shared goals and mutual learning, CES is collaborating with HBCAAC to build a safe, accessible and free-of-charge surgical program. Working alongside hospital leadership, CES performed surgical workshops to develop needed skills, teamwork classes to build a positive working environment, and focus groups and surveys to consistently measure the staff's perception of the program. Furthermore, CES purchased needed equipment and recruited surgical specialists through 6 additional partnerships. As a result, HBCAAC had a successful surgical campaign in December 2018, performing 17 tubal ligations. The program is also moving toward regularly scheduled surgical procedures performed by a full-time CES general surgeon. Additionally, of 32 respondents to a hospital survey, 93.5% specified approval of the collaboration between CES and HBCAAC. This partnership model can be used by nongovernmental organizations to help public hospitals increase access to surgery in underserved areas.

Impact of transplantation public policies in Colombia: Do they improve organ transplantation? *D. Mendoza Mantilla, E. Martínez Espitia, J. Beltrán Hernández, S. Rincon Franco, B. J. Pinto.* From the Colombian School of Medicine, University El Bosque, Bogotá, Colombia (Mantilla, Espitia, Hernández, Franco); and the Bioethics program, University El Bosque, Bogotá, Colombia (Pinto).

Background: In 2016, a new law related to transplantation policies and organ donation was promulgated in Colombia. This new law was established with the aim of reducing obstacles to the availability and procurement of organs for transplantation country wide to perform this procedures in cases of presumption of donation. The aim of this study was to compare the number of transplant procedures before and after implementation of the law in order to measure its impact. **Methods:** Data from the Colombian National Health Institute and the transplantation network of Colombia were analyzed. We analyzed all the possible, potential, eligible and real donors for over 30 000 deceased people able to donate between 2006 and 2018. Descriptive statistics and comparison of data before and after 2016 were performed. **Results:** We found an increase in the number of effective transplant procedures (676, odds ratio 1.66), which was prevalent for renal transplantation. However, availability for donors' relatives did not improve owing to logistic/technical problems, misinformation and disorganization in the network. **Conclusion:** The number of transplant procedures increased after implementation of the new law. Changes in public policy resulted in an increase in the number of procurement processes and transplant procedures in Colombia. A trainee team for transplantation and a stronger network are necessary to improve the availability of organs.

Evaluation of the nutritional status of pediatric patients in Soroti, Uganda. *Cyrus Bhiladvala, Damian Duffy, Mary Margaret Ajiko, Kishore Mulpuri, Eleanor Reimer, Phyllis Kisa, Robert Baird.* From the Office of Pediatric Surgical

Evaluation and Innovation, Department of Medicine, University of British Columbia, Vancouver, British Columbia, Canada (Bhiladvala, Duffy, Ajiko, Kisa, Baird); the BC Children's Hospital, Vancouver, British Columbia, Canada (Bhiladvala, Duffy, Mulpuri, Reimer, Kisa, Baird); the University of British Columbia, Vancouver, British Columbia, Canada (Bhiladvala, Duffy, Mulpuri, Reimer, Baird); and the Soroti Regional Referral Hospital, Soroti, Uganda (Ajiko).

Background: Malnutrition in pediatric patients leads to adverse clinical and surgical outcomes. According to the Uganda Health and Demographic Survey of 2016 (UHDS 2016), the frequency of severe malnutrition in the healthy population surrounding Soroti is 3.3% for stunting, 0.4% for underweight and 0.3% for wasting. The aim of this study was to understand domestic factors affecting the discrepancy in nutritional status between pediatric patients at Soroti Regional Referral Hospital and the general population from UHDS 2016. **Methods:** Validated rapid assessment of patient anthropometrics; assessment of pathology, demographics and food security conducted with the patients' guardians. **Results:** Data were gathered for 99 patients. Severe stunting, weight deficiency and wasting were observed in 25.6%, 24.7% and 19.1% of patients, respectively. Three-quarters (74%) of guardians said their children were missing food items, the most common of which were milk, eggs and meat. A total of 77% of guardians had received a seventh grade education or less. The median family size was 8 (4 adults, 4 children). The median family income, 41 000 UGX (US\$10.50) per month, falls below the United Nations Development Programme extreme poverty line of US\$1.25 per day. **Conclusion:** The high incidence of severe malnutrition requires systemic attention. Patients from families reporting food insecurity or earning less than 41 000 UGX per month are more often stunted and underweight.

Expanding surgical care in Haiti: the human rights argument for a national surgical, anesthesia and obstetric plan. *Jordan Pyda, Sterman Toussaint, Rolvix H. Patterson, Nicholas Carter, Ernest Barthélemy, Mark Shrime, Louis Frank Télémaque, Laëlle Mangurat, John G. Meara, Michelson Padovany.* From the Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA (Pyda, Patterson, Barthélemy, Shrime, Meara); the Département de Chirurgie, Hôpital Universitaire de Mirebalais, Mirebalais, Haïti (Toussaint); Zanmi Lasante, Croix-des-Bouquets, Haïti (Toussaint); the Department of Surgery, Vanderbilt University Medical Center, Nashville, Tennessee, USA (Carter); the Département de Chirurgie, Faculté de Médecine et de Pharmacie, Université d'État d'Haïti, Port-au-Prince, Haïti (Télémaque); the Département de Chirurgie, Hôpital la Providence des Gonaïves, Gonaïves, Haïti (Mangurat); and the Département de Chirurgie, Hôpital Saint Boniface, Fond-des-Blancs, Haïti (Padovany).

Background: Certain conditions detrimental to health and well-being require surgical, anesthesia or obstetric care for treatment. In ratifying the 1948 Universal Declaration of Human Rights (UDHR) and the 1966 International Covenant

on Economic, Social and Cultural Rights (ICESCR), Haiti has committed to guaranteeing the right to the "highest attainable standard" of health for its citizens. In supporting World Health Assembly resolution 68.15, the right to health now explicitly extends this commitment to surgery, anesthesia and obstetrics (SAO). **Methods:** We performed a human rights analysis of key Haitian national and international documents to examine the moral and legal arguments for the provision of universal SAO care in Haiti. We evaluated health policy documents for SAO care and examined how conceptualizing SAO care as a human right can facilitate the incorporation of surgical care into health policy. **Results:** The 1801 Constitution of Saint-Domingue recognizes a role of the Haitian State in supervising health care delivery. The current Constitution of 1987 (amended May 2011) elaborates: "the State has the absolute obligation to guarantee the right to life, health ... for all citizens without distinction, in conformity with the [UDHR]." The Plan Directeur de Santé, Politique Nationale de Santé and Paquet Essentiel de Services are key national health policy documents that could serve to delineate SAO policy. **Conclusion:** The human rights framework offers an important basis for the integration of SAO care into health policy. A national SAO plan may facilitate the translation of surgical care provisions guaranteed by human rights treaties into actionable national policy and programs in Haiti.

Integrating surgical simulation into a training curriculum for global surgery: a systematic review of cleft palate training models. *Maria Raveendran.* From the Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada.

Background: Simulation-based training promises to achieve increased competency while maximizing patient safety. Cleft palate, which contributes substantially to the global burden of surgically treatable diseases, is a challenging repair to learn owing to the high level of skill required, delicate oral tissues and limited space of an infant oral cavity. Simulation training can allow palatoplasty education to move from an observational to a competency-based learning. Hence, this systematic review presents models described in the literature that simulate cleft palate repair and integrates them into a global surgery training curriculum. **Methods:** A systematic review was conducted in accordance with PRISMA guidelines through an electronic search of the MEDLINE and Cochrane databases. Data regarding the construction of the model, palatoplasty skills taught, evidence of improved outcomes, fidelity, cost and reusability were extracted. Models were stratified into levels based on their anatomic fidelity and realism. **Results:** The database search returned 3260 articles. Eleven articles were considered eligible for inclusion. The models were integrated into a palatoplasty training curriculum that provides an incremental, step-wise exposure to palatoplasty. Cost and reusability versus anatomic fidelity and realism are discussed, along with their implications for implementation of simulation models in global surgery. **Conclusion:** Cleft palate is a globally important birth defect, and its repair is difficult to learn. This review presents 11 models of cleft palate described in the literature and discusses their potential to be incorporated into a global surgery training curriculum for cleft palate repair, highlighting the advances and gaps in current cleft palate simulation.

Development and evaluation of a trauma registry mobile application for use in low-income settings. *Chantalle Grant, Ali Mobamed Ali, Felix Oyania, Patrick Oloya, Tessa Robinson, Brian Cameron, Martin Situma, David Bigam, Abdullah Saleh.* From the University of Alberta, Edmonton, Alberta, Canada (Grant, Bigam, Saleh); the Mbarara University of Science and Technology, Mbarara, Uganda (Ali, Oyania, Oloya, Situma); and the Division of Pediatric General Surgery, McMaster University, Hamilton, Ontario, Canada (Robinson, Cameron).

Background: Trauma registries are a focus for quality improvement in low- and middle-income countries (LMICs). As mobile health applications have been shown to be effective health care tools in LMICs, we developed a trauma registry mobile application and evaluated its usability in a regional hospital setting in Mbarara, Uganda. **Methods:** An open-source mobile application was developed from a minimal data set from a paper-based trauma registry at Mbarara Regional Referral Hospital (MRRH), which enabled uploading to an encrypted, password-protected server. Trauma health care providers were recruited to trial the application, complete a modified Unified Theory of Acceptance and Use of Technology questionnaire, and provide qualitative, open-ended feedback. **Results:** Health care providers scored the application highly on performance expectancy, effort expectancy and attitude toward technology (with 92.3%, 94.1% and 92.1% of responses, respectively, ranked at 5 or higher); lower scores were obtained for social influence (84.4%), facilitating conditions (72.0%) and self-efficacy (86.3%). The average age of the respondents was 29.1 years. Qualitative themes identified included ease of use, comprehensiveness of data, and the research and clinical benefits of the proposed electronic database. **Conclusion:** This study demonstrates the development and evaluation of a mobile trauma application for use in low-income settings. As performance expectancy scores and a young user age have shown to be most predictive of future usage of technology in health care, this open-source trauma registry mobile application shows promise for future adoption by health care professionals at MRRH.

Prevalence of and factors associated with hydatidiform mole among patients undergoing uterine evacuation at Mbarara Regional Referral Hospital. *Mumbere Mulisya Olivier, Drucilla J. Roberts, Mpiima Derrick, Lugobe Henry, Ssemujju Augustin, Masinda Abraham, Twizerimana Hillary.* From the Femmes Engagées pour la Promotion de la Santé Intégrale (FEPSI) Hospital, Butembo, Democratic Republic of the Congo.

Background: We sought to determine the prevalence of and factors associated with hydatidiform molar gestations among patients undergoing uterine evacuation at Mbarara Regional Referral Hospital (MRRH), Uganda. **Methods:** This was a cross-sectional study carried out from November 2016 to February 2017. All patients admitted for uterine evacuation for nonviable pregnancy were included. The study registered 181 patients. Data were collected on sociodemographics, medical conditions, obstetrics and gynecological factors. The evacuated tissue received a full gross and histopathological examination. Cases of pathologically suspected complete hydatidiform mole were confirmed by p57 immunohistochemistry. Data were analyzed by means of Stata 13. **Results:** The prevalence of hydatidiform

mole was 6.1% (11/181). All detected moles were complete hydatidiform moles; there were no partial hydatidiform moles diagnosed. A clinical diagnosis of molar pregnancy was suspected in 13 patients, but a molar pregnancy was confirmed histologically in only 9 cases (69.2%). Two cases were clinically unsuspected. Factors that had a significant relationship with complete hydatidiform mole included maternal age of 35 years or more (adjusted odds ratio [OR] 13.5, 95% confidence interval [CI] 1.46–125.31; $p = 0.00$), gestational age beyond the first trimester at the time of uterine evacuation (adjusted OR 6.2, 95% CI 1.07–36.14; $p = 0.04$) and history of previous abortion (adjusted OR 4.3, 95% CI 1.00–18.57; $p = 0.05$). **Conclusion:** The prevalence of complete hydatidiform mole was high, at 6.1%. Associated risk factors included advanced maternal age (≥ 35 yr), history of previous abortion and gestational age beyond the first trimester at the time of evacuation.

Improving community health care management of burns and injuries in Chin State, Myanmar: Area Coordinator Workshop. *Emma Pedlar, Bei Cho Tha, Shwe Hu Lian, Grace Dubois.* From the Salford Royal NHS Foundation Trust, Stott Lane, Salford, UK (Pedlar); Health and Hope Myanmar, Lailenpi, Matupi Township, Chin State, Myanmar (Tha, Lian); and Health and Hope UK, Chorleywood, Herts, UK (Dubois).

Background: Chin State has the most limited access to health care in Myanmar. Health and Hope Myanmar (HHM) is a charity based in Lailenpi, Chin State. It has trained 834 community health care workers (CHWs) to provide basic medical care for 551 villages supported by 28 area coordinators (ACs). The ACs have received additional training through workshops led by visiting UK specialists. The aim of the February 2019 workshop included basic management of burns and injuries, conditions that are common in rural communities and often treated poorly. **Methods:** The AC Workshop ran from Feb. 5 to 11, 2019. A team from the United Kingdom led the training on basic management of burns and injuries, communication skills and mentorship. A diverse range of teaching methods were used, including simulation and surgical skills training. A burns treatment guideline in Burmese was developed for use in the villages. **Results:** The effectiveness of the workshop was evaluated by means of pre- and postteaching questionnaires. The ACs were tested on their knowledge and level of confidence at managing injuries and burns, with an increase in all domains. The guidelines were developed with the help of local HHM doctors and were received positively by the ACs. **Conclusion:** Training local CHWs in the prevention, management and further referral of trauma is an effective way of providing health care to Myanmar's poorest population. Ongoing monitoring and evaluation will be able to demonstrate the dissemination of knowledge to the CHWs.

Analysis of regional access to ophthalmology care in Colombia. *Brian Pérez, Derrick A. Dabian, Angélica Clavijo, Andrés M. Rubiano.* From the Faculty of Medicine, Universidad El Bosque, Bogotá, Colombia (Pérez); Ophthalmology, Universidad El Bosque, Bogotá, Colombia (Dabian); Universidad El Bosque, Bogotá, Colombia (Clavijo); Neurotrauma Research, Universidad El Bosque, Bogotá, Colombia (Rubiano); and InciSioN Colombia (Rubiano).

Background: In 2015, was estimated that 253 million people had visual impairment worldwide. Of these, 36 million were blind, and 217 million had moderate to severe visual impairment. The few data from Colombia indicate a prevalence of blindness that varies from 1.09% (95% confidence interval [CI] 0.79%–1.48%) to 1.79% (95% CI 1.14%–2.63%). Most causes of blindness are avoidable, such as cataract, glaucoma, trachoma, onchocerciasis and diabetic retinopathy. In low- and middle-income countries, the lack of access to an ophthalmology service delays the opportunity of care and management of these pathologies. The objective of this study was to show the distribution and availability of ophthalmology services in different regions of Colombia and to report which areas have low availability of ophthalmology services. **Methods:** We analyzed the REPS database (Special Registry of Health Service Providers) of the Colombian Ministry of Health for medical services. **Results:** Fifty percent of the Colombian states have fewer than 1 ophthalmology service per 100 000 inhabitants. The departments most affected are Guainía and Vichada, which have a rate of 0. Even the capital (Bogotá) has fewer than 1. Higher rates are reported in Cesar (1.6) and Vaupés (2.2). **Conclusion:** The regional availability of ophthalmology services in Colombia is deficient. It will be important to develop strategies in order to improve coverage of ophthalmological services.

Accepted Abstracts — Not Being Presented

Longitudinal validation of the Mbarara Surgical Services Quality Assurance Database. *Paul Firth, Gustaf Drevin, Katherine Albutt, Moris Baluku, Caleb Tuhumwiire, Hao Deng, Nicholas Musinguzi, Vicki Modest, Joseph Ngonzi, Stephen Ttendo.* From the Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts, USA (Firth, Deng, Modest); the Karolinska Institute, Stockholm, Sweden (Drevin); the Department of Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts, USA (Albutt); the Department of Anesthesia and Critical Care, Mbarara Regional Referral Hospital, Mbarara University of Science and Technology, Mbarara, Uganda (Baluku, Ttendo); the Department of Surgery, Mbarara Regional Referral Hospital, Mbarara University of Science and Technology, Mbarara, Uganda (Tuhumwiire); the Harvard MUST Collaborative, Mbarara, Uganda (Musinguzi); and the Department of Obstetrics and Gynaecology, Mbarara Regional Referral Hospital, Mbarara University of Science and Technology, Mbarara, Uganda (Ngonzi).

Background: The Mbarara Surgical Services Quality Assurance Database (SQUAD) is a surgical services outcomes database derived from the paper record system of a Ugandan secondary referral hospital. Validation of the accuracy and completeness of this database will heighten confidence in conclusions derived from the database. **Methods:** We examined the period August 2013 to January 2017. Two researchers independently extracted data from 170 charts on 24 key variables. Descriptive analyses regarding data accuracy were conducted with summarized point estimate of percentage of matched cases. We estimated a binomial proportion 95% confidence interval calculated from the

comparative results of recorded patient observations. Two-tailed binomial tests for proportions were conducted for all variables against predefined accuracy criteria of 0.95 and 0.85. We also sampled the completeness of the capture of charts returned to the medical records department, and of entries in the ward and operating room logbooks. **Results:** The rate of agreement between completed validation observations from charts and SQUAD data was 93.2% ($n = 3734/4005$ data points). Binomial tests showed that accuracy was not significantly lower than 95% for 15 variables and was not significantly lower than 85% for 7 variables. The database captured 98% of all charts returned to the medical records department, and 97%–100% of ward and operating room logbook entries. **Conclusion:** Key variables in the Mbarara SQUAD have been transcribed with a high degree of accuracy and completeness. The database has also captured the hospital population with a high degree of completeness.

Analysis of perceptions of the ethical conduct of surgical missions in Zimbabwe. *Faith C. Muchemwa.* From the University of Zimbabwe College of Health Sciences, Harare, Zimbabwe.

Background: Many international surgical missions visit Zimbabwe. These include plastic surgery, urogynecology, cardiac and, recently, orthopedic missions. These are well advertised in the local print media and television and via short message service blast by local mobile networks. **Methods:** Qualitative review of how the surgical missions are perceived by nurses and doctors who work with volunteers. A questionnaire focused on participants' perceptions of the strengths and weaknesses of the surgical missions and how they thought these could be improved was administered. The questionnaire focused on the ethical conduct on the members of the visiting teams at a group and individual level. **Results:** Respondents appreciated the work done by volunteer missions. Issues regarding photographing patients, informed consent, training of local surgeons, safety, quality of care and level of experience of the team members were highlighted as the main factors determining the perception of a successful visit. **Conclusion:** Volunteer missions carrying out work in Zimbabwe should be conscious of ethical considerations in order to provide standard and safe care, and enable continuity of the programs.

Obstacles to and enablers of access to improved surgical care delivery in Uganda. *S. Munyagwa, B. Kitiibwa, J. Namale.* From the Regional Community Health Support Initiative (RCHSI), Rakai, Uganda (Munyagwa, Kitiibwa); and Nkozi University, Mpigi, Uganda (Namale).

Background: Surgical care delivery is poorly understood in resource-limited settings. To effectively move toward universal health coverage, there is a critical need to understand surgical care delivery in developing countries. This study aimed to identify the obstacles to and enablers of access to surgical care delivery in Uganda. **Methods:** In this mixed-methods study, we 1) applied the Surgeons Overseas Personnel, Infrastructure, Procedures, Equipment, and Supplies (PIPES) survey tool to assess surgical capacity, 2) retrospectively reviewed inpatient records, 3) conducted 4 semistructured focus group discussions with 18 purposively sampled providers involved in perioperative

care and 4) observed the perioperative process of care using a time and motion approach. Descriptive statistics were generated from quantitative data. Qualitative data were thematically analyzed. **Results:** The PIPES survey revealed severe deficiencies in workforce (P-score = 14) and infrastructure (I-score = 5). Equipment, supplies and procedures were generally available. Male and female wards were overbooked 83% and 60% of the time, respectively. Providers identified lack of space, patient overload and superfluous patients' attendants as barriers to surgical care. Workforce challenges were tackled by means of teamwork and task sharing. Inadequate equipment and processes were addressed through improvisation. All observed subjects ($n = 31$) received interventions. The median decision-to-intervention time was 2.5 hours (interquartile range [IQR] 0.4–21.4 h). However, 48% of subjects experienced delays. The median decision-to-intervention delay was 14.8 hours (IQR 0.9–26.6 h). **Conclusion:** Despite severe workforce and physical infrastructural deficiencies in Uganda, providers are adjusting and innovating to deliver improved surgical care services.

Exploring students' experiences of ethical challenges during their clinical practice in Uganda. *G. Namata, F. Lugwana, B. Sitiibwa, P. Nabiwata.* Uganda Young Health Research Scientist UYHRS, Uganda (Namata, Lugwana, Sitiibwa); and Fortune Community Initiatives and Awareness (FCIA), Uganda (Nabiwata).

Background: Students frequently face ethical problems in their clinical practice. Awareness of such problems and challenges is important for their ability to perform moral practice. The aim of this study was to explore students' experiences of ethical problems during their clinical practice in Uganda. **Methods:** A phenomenological hermeneutic approach was employed to interpret and investigate the students' lived experiences. Phenomenology ensures an open attitude to the informants' life-world, while hermeneutics allows a participatory dialogue and intersubjectivity between the interviewer and informants. The method included active interpretative listening to the meanings contained in the statements, which presented an opportunity to clarify and confirm the information provided during the interviews. **Results:** Overall, 3 themes emerged from the data: 1) conflict between patient rights and the guardian's presence in the hospital, 2) conflict between violation of professional values and patient rights caused by unethical behaviour and 3) conflict between moral awareness and the ideal course of action. The students had difficulties ensuring patient rights and acting in accordance with Western norms and values, which are not always appropriate in the Ugandan context. **Conclusion:** Teaching and learning methods that encourage the use of reflective models will allow students to critically reflect on how Western individual-oriented norms and values can be applied in nursing practice. Students need role models to be able to face challenges and act as role models themselves in order to motivate others and demonstrate professional attitudes toward patients.

Simulation capacity building for anesthesia emergencies in rural India — a 1-year qualitative analysis. *Isaac Wasserman, Alexander Peters, Vatsbalan Santhirapala, Shivani Mitra, Simone Sandler, Emma Svensson, David Ljungman, Regi George, Arundbatbi Ambepu, Veena Sheshadri, Raman Kataria,*

Salim Afshar, Jerome Galea, Christopher Roussin, Matthew Taylor, Nandakumar Menon, Craig McClain. From the Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA (Wasserman, Peters, Santhirapala, Sandler, Svensson, Ljungman, Afshar, McClain); the Department of Plastic and Oral Surgery, Boston Children's Hospital, Boston, Massachusetts, USA (Wasserman, Peters, Santhirapala, Mitra, Afshar); the Icahn School of Medicine at Mount Sinai, New York, New York, USA (Wasserman); the Department of Surgery, Weill Cornell Medical College, New York, New York, USA (Peters); the Magill Department of Anaesthesia, Chelsea and Westminster Hospital, London, UK (Santhirapala); Lund University, Lund, Sweden (Svensson); the Department of Surgery, Institute of Clinical Sciences, University of Gothenburg, Gothenburg, Sweden (Ljungman); the Tribal Health Initiative, Sittilingi, Tamil Nadu, India (George, Ambepu); the Gudalur Adivasi Hospital, Gudalur, Tamil Nadu, India (Sheshardi, Menon); Jan Swasthya Sahyog, Bilaspur, Chhattisgarh, India (Kataria); the School of Social Work, University of South Florida, Tampa, Florida, USA (Galea); the Simulator Program, Boston Children's Hospital, Boston, Massachusetts, USA (Roussin, Taylor); and the Department of Anesthesia, Boston Children's Hospital, Boston, Massachusetts, USA (McClain).

Background: The benefits of simulation-based training in high-income countries are well described. The best way to scale simulation training to low- and middle-income countries (LMICs) remains undescribed. We sought to plant simulation training programs for anesthesia emergencies in 3 rural Indian hospitals. **Methods:** Two Indian consultant anesthetists without experience in medical simulation underwent a 3-day train-the-trainer course at Boston Children's Hospital's (BCH) Simulator Program. They returned to their home institutions and launched simulation programs with limited resources, including an airway mannequin and mock patient monitor. The 1-year effectiveness of this training was qualitatively evaluated by means of individual, in-depth interviews of simulation leaders. Interviews lasted 60 minutes and were audio-recorded, transcribed verbatim, thematically coded and analyzed. **Results:** Four staff members (responsible for conducting medical simulations) at 2 rural hospitals in India were interviewed. None attended the BCH training; instead, they received on-the-job training from BCH-trained colleagues. Barriers to effective, local implementation of simulation programs fell into 3 categories: time required to run simulations, hierarchical culture and scarce resources. Successes included ongoing simulation exercises 1 year after the initial BCH training, increasing interdisciplinary teamwork and improvement in perceived competency managing emergencies. A common request was for standardized videos/resources to both help train simulation facilitators and demonstrate to participants what occurs in a well-run simulation. **Conclusion:** An in-person, train-the-trainer approach to promoting medical simulation programs in LMICs produced durable simulation programs 1 year later. Despite local constraints, participants felt empowered to continue running their own simulations and continued to apply this methodology to additional medical scenarios.

Inclusion of children's surgery in national surgical plans: experience from Nigeria's NSOAP. *Emmanuel A. Ameh,*

Jamie Anderson, Justina Seyi-Olajide, Omolara Williams, Omolara Faboya, Faruk Suleiman, Sani Adamu, Stephen Kache, Tunde Sholadoye, Jerry Makama, Hyginus Ekwunife. From the Division of Paediatric Surgery, National Hospital, Abuja, Nigeria (Ameh); the Department of Surgery, University of California, Davis, Sacramento, California, USA (Anderson); the Paediatric Surgery Unit, Lagos University Teaching Hospital, Lagos, Nigeria (Seyi-Olajide); the Paediatric Surgery Unit, Lagos State University Teaching Hospital, Lagos, Nigeria (Williams, Faboya); the Paediatric Surgery Unit, Federal Teaching Hospital, Gombe, Nigeria (Suleiman, Adamu); the Department of Surgery, Kaduna State University Teaching Hospital, Kaduna, Nigeria (Kache, Makama); the Division of Paediatric Surgery, Ahmadu Bello University Teaching Hospital, Zaria, Nigeria (Sholadoye); and the Paediatric Surgery Unit, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria (Ekwunife).

Background: Despite the large population of children in low- and middle-income countries (LMICs), children's surgery has not been specifically included in national surgical, obstetrics and anesthesia plans (NSOAPs). Without including children's surgery in the baseline assessment for NSOAPs, the required information and data will not be available to plan for this age group. This is a report of experience from Nigeria of efforts to include children's surgery as a specific component of the NSOAP. **Methods:** The Children's Surgical Assessment Tool, created by the Global Initiative for Children's Surgery (GICS), was used along with the Program in Global Surgery and Social Change/World Health Organization Surgical Assessment Tool for baseline assessment to generate baseline data for children's surgery for the NSOAP for Nigeria. Fifty hospitals in 4 states and the federal capital territory were surveyed. **Results:** The surveyed states covered a total population of 48 million people. Among the 50 hospitals surveyed, only 7 of 9 tertiary hospitals had the capacity to provide children's surgery. All other hospitals lacked capacity or performed basic children's surgery irregularly. Essential and emergency children's surgery was nonexistent at first-level hospitals. With these data, it is now possible to plan for and include children specifically in the NSOAP for Nigeria. **Conclusion:** The companion GICS children's surgery assessment tool made it possible to evaluate capacity for children's surgery, which would have been difficult with the NSOAP Surgical Assessment Tool. It is crucial to include children in the baseline assessment to enable specific planning and inclusion in NSOAPs. Details of the process in Nigeria will be discussed.

Effects of barriers to care on surgical equity at a tertiary hospital in Kigali, Rwanda. *T. Cyuzuzo, M. Dworkin (primary authors), F. Ntirenganya, J. Rickard.* From the University of Rwanda College of Medicine and Health Sciences, Kigali, Rwanda (Cyuzuzo, Ntirenganya); Thomas Jefferson University, Philadelphia, Pennsylvania, USA (Dworkin); and the University of Minnesota Department of Surgery, Minneapolis-St. Paul, Minnesota, USA (Rickard).

Background: The disproportionate distribution of surgery across the globe has left many in lower- and middle-income countries (LMICs) without proper care. Patients often have complex surgical problems that are worsened by delayed presentation. Using

the Three Delays model, we aimed to describe barriers in surgical intervention for patients at a tertiary hospital in Kigali, Rwanda. **Methods:** An interview-based study was performed at a tertiary hospital in Rwanda in which all general and orthopedic surgery patients undergoing surgery were asked questions regarding their presurgical interactions with the health care system. **Results:** Over a 3-week period, 24 general surgery and 49 orthopedic patients were interviewed. Delays in seeking care were experienced by 34 patients (46.6%) and included transportation issues (16 [47%]) and not knowing care was necessary (14 [41%]). Delays in reaching care were experienced by 17 patients (23.3%) and included travel issues (14 [82%]) and not knowing care was necessary (6 [35%]). Delays in receiving care at the referral hospital were encountered by 46 patients (63.0%) and included unavailable surgeon (23 [50%]) or operating room (18 [39%]). **Conclusion:** The most common cause for delay, in terms of both time and number of patients, was transportation issues. This factor is concerning because few facilities in Rwanda are capable of providing surgical care, which forces patients to travel long distances. Systems-based initiatives aimed at improving transportation infrastructure could increase access. Training providers at district hospitals to perform rudimentary procedures could also lead to improved access to and distribution of surgical care.

Building sustainable surgical capacity in low-income countries: the example of neurosurgery in Malawi. *P. Kamalo, E. Nkangala, H. Slettebo, K. Hanche-Olsen.* From Queen Elizabeth Central Hospital, Blantyre, Malawi (Kamalo, Nkangala); and the Oslo University Hospital, Oslo, Norway (Slettebo, Hanche-Olsen).

Background: Most low-income countries (LICs) lack capacity and infrastructure for delivering much-needed surgical care. Different models exist whereby high-income countries (HICs) support LICs in provision of surgical services. We present an example of a system aimed at developing sustainable surgical capacity. **Methods:** Queen Elizabeth Central Hospital (QECH) in Blantyre, Malawi, from October 2013 embarked on a long-term collaboration with Oslo University Hospital, Norway. The collaboration aims at building a sustainable and modern neurosurgical service through capacity building and technical support. The process started with Malawi seeking the collaboration and presenting a vision for neurosurgery in Malawi. The prerequisite was a local trained professional willing to work in the home country. **Results:** Multisectoral involvement from both Malawi and Norway followed, resulting in refurbishment and equipping of an operating theatre for neurosurgery and a 7-bed neurosurgical high-dependency unit. Over 5 years, 33 junior QECH staff each spent 6 months in Norway, learning skills in specialized neurosurgical care. Eleven experienced staff from Norway have spent 6–24 months in Malawi teaching staff on site the pearls of neurosurgical care. Additionally, there have been support visits by neurosurgical, anesthetic and technical consultants from Norway to Malawi. The operating theatre capacity at QECH doubled from 2 operating days to 4 or 5 days per week. A total of 410 operations were performed in 2017, compared to 257 operations in 2013, with the biggest rise being in major neurosurgical operations, with acceptable results. **Conclusion:** We recommend this model to those wanting to make a lasting impact.

Experiences and perceptions of medics regarding surgical disease research in low-resource countries. *Skylar Jayden Dembe, Ivan Lutaya, Nelson Ssemambo.* From Green World Uganda (GWU), Uganda (Dembe, Lutaya); and Makerere University, Kampala, Uganda (Ssemambo).

Background: Research is critical to training in and practice of surgery and anesthesia in all settings, regardless of available resources. Unfortunately, the output of surgical and perioperative research from Africa is low. Surgical and anesthesia trainees in Uganda are required to conduct research, although few publish findings or go on to pursue careers that incorporate research. We believe that early career experiences with research may greatly influence physicians' future conduct and utilization of research. We therefore sought to analyze trainee experiences and perceptions of research to identify interventions that could increase production of high-quality, locally led surgical disease research in our resource-constrained setting. **Methods:** A descriptive, cross-sectional survey was conducted among anesthesia and surgery trainees by means of a pretested, self-administered questionnaire. Data were tabulated and frequency tables generated. **Results:** Ninety-four percent of respondents identified research as important to career development, and 85% stated that they intend to publish their dissertations. The research dissertation was considered a financial burden by 64%. Also, 49% reported that their departments place low value on their research, and few of the findings are used. Trainees reported that lack of protected research time, difficulty in finding research topics and inadequate mentorship are the main challenges to conducting research projects. **Conclusion:** Our anesthesia and surgery trainees spend considerable resources on research endeavours. Most have significant interest in incorporating research into their careers, and most intend to publish their work in peer-reviewed journals. Here we identify several challenges facing trainees including research project development, financing and mentorship.

Information for elective surgical procedures: adequacy of what anesthesiologists tell patients at preoperative review. *M.O. Osazuwa, C.O. Imarengiaye, F.D. Asudo.* From the National Hospital Abuja, Abuja, Nigeria (Osazuwa); the University of Benin Teaching Hospital, Benin-City, Nigeria (Imarengiaye); and the University of Abuja Teaching Hospital, Gwagwalada, Nigeria (Asudo).

Background: Information about surgery and anesthesia is often provided during preoperative assessment. The adequacy of preoperative review validates informed consent given by patients. This study determined the adequacy of information given to patients, parents or guardians in order to obtain informed consent for anesthesia. **Methods:** Structured questionnaires were administered anonymously to anesthesiologists in 3 tertiary hospitals in Nigeria. The questions sought to determine sufficiency of anesthesia information given to patients, parents or guardians before elective surgery. Responses were analyzed with SPSS version 25. **Results:** Seventy-two (91.1%) of 79 anesthesiologists responded. About half of respondents (51.4%) had practised anesthesia for over 5 years. The respondents were senior registrars (40.3%), registrars (33.3%) and consultants (22.2%); 2 were professors, and 1 was a diploma student. A sizable proportion of respondents rarely or sometimes discussed complica-

tions (44.4%) and rarely selected postoperative pain management (41.7%), and 20.8% never discussed postoperative analgesia with patients. Surgeons obtained consent for surgery and anesthesia. The suggested options for improved review included an anesthesia clinic (37.5%), earlier reviews and more time with the patient (34.7%) and more anesthesia staff (16.7%). **Conclusion:** Patients do not have enough information on pain management and complications that may arise from anesthesia. A separate anesthesia consent form is needed. The preoperative review process appears inadequate in Nigeria.

Ethical considerations with short-term surgical medical missions. *Waruguru Wanjau, Holly Taylor.*

Background: Low- and middle-income countries (LMICs) do not have sufficient human resources to fulfill their surgical needs. These countries represent 48% of the global population but have only 20% of the surgical workforce. Some of the demand is addressed by short-term medical missions (STMMs) conducted by medical personnel from higher-income countries, which bring up a variety of ethical concerns. **Methods:** A literature review of surgical and public health ethics literature was conducted for a special studies elective class on ethics and global surgery as part of a Masters of Public Health program. **Results:** A general concern about surgical STMMs is that there are currently no universal guidelines for how care ought to be delivered. More specifically, there is a concern about patient safety and well-being. There are 2 related concerns: who provides the care patients need, and how are patients cared for after the surgical procedure is completed. The second concern is related to how finite resources are allocated to patients in need. **Conclusion:** Providing access to high-quality and safe surgical procedures to patients who will benefit, while not exposing them to unreasonable risk, should be the main purpose of surgical STMMs as they continue to fill the gap of inadequate surgical care in LMICs. A minimum level of training ought to be required before trainees join STMMs. Minimal standards of care should be set with regard to accepted practices and scope of surgeries that can be performed in surgical STMMs. Intentional patient selection will ensure that those who need it the most will benefit from the services offered by STMMs.

Ethical factors influencing parental consent in pediatric clinical research in South East Nigeria. *Obinna Ajuzieogu, Amucheazi Adaobi.* From the University of Nigeria, Ituku-Ozalla Campus, Enugu, Nigeria.

Background: Ethical issues ranging from social to medicolegal concerns are involved when consent is obtained as a surrogate for children. This study aimed to appraise the ethical issues involved in obtaining parental consent in the pediatric clinical trial. **Methods:** One hundred parents of children recruited for clinical research on dorsal penile block completed questionnaires from March 2017 to February 2018. The data collected were on parent demographics and concerns and their reasons for giving consent to the study. A Likert-type scale was used to rate their responses. Older children were administered assent forms, and any conflict of opinions was recorded. The data were displayed

as tables and charts. **Results:** We identified free or subsidized surgery as the most important motive for accepting enrolment (75%). The commonest concern expressed was regarding the risks associated with the procedure. The major ethical issues identified were among teenagers, who preferred cash inducement to participate. A total of 79 parents did not seek their child's approval before consenting to the research. There was a negative correlation between consent and socioeconomic status. The need to help medical knowledge improve was secondary to economic reasons for acceptance. The commonest conflict of opinion was on the type of anesthesia. **Conclusion:** Families will consent to having their children involved in research if it reduces their bills. Lower education and socioeconomic status of the family correlated positively to acceptance. Assent from teenagers should be sorted for in anesthesia research.

A strategic approach to improving access to surgical services for vulnerable populations in Uganda. *K.E.N. Tumubeirwe, R. Musoke, R. Nalumu.* From the Community Based Health Care Council (CBHCC), Uganda-Mubende, Uganda (Tumubeirwe, Musoke); and Makerere University, Kampala, Uganda (Nalumu).

Background: Surgical camps are preplanned activities in which volunteer surgical teams congregate at a specified place(s) and perform a wide range of mostly elective procedures for a limited period. This is usually at no cost to the patients, who belong to vulnerable (poor and hard to reach) communities. We describe a surgical camp model and its challenges as a means of improving access to surgical services. **Methods:** Cross-sectional descriptive study. Data from a recent Association of Surgeons of Uganda surgical camp were collected and analyzed for demographics, costs, procedure types and rates, challenges encountered and solutions. Personnel who participated in this exercise included specialist surgeons, surgical residents, medical officers, clinical officers, anesthetists and theatre nurses. **Results:** In total, 551 procedures were performed during a 4-day-long camp. The mean age was 35 (standard deviation 23) years, and the male:female ratio was 2:1. Herniorrhaphy, skin lump excision, hydrocelectomy and thyroidectomy accounted for 81% of the procedures. The average cost per procedure was US\$73. **Conclusion:** Surgical camps offer increased access to surgical services for vulnerable populations. Hernias and goiters were most common. Surgical camps should become an integral part of health service delivery in low-resourced environments.

Prospective cohort study to determine if perioperative mortality at the University Teaching Hospital in Lusaka, Zambia has changed compared to historical data from 1987. *Henry Nchimunya, Dylan Bould, David Snell, Emma Lillie, Chadwick Ngwisha, Ahmed Yursuf, Lesley Crichton.* From University Teaching Hospital, Department of Surgery, P/B RWIX, Lusaka, Zambia (Nchimunya, Ngwisha, Crichton); Zambia Anaesthesia Development Program, P/B RWIX, Lusaka, Zambia (Bould, Snell, Lillie); and Mother and Newborn Hospital, P/B RWIX, Lusaka, Zambia (Yursuf).

Background: Although low- and middle-income countries (LMICs) are the regions of the world with the greatest gap in

access to safe surgical and anesthetic services, there are fewer published data for these countries on perioperative mortality indices. Global trends are that perioperative mortality has declined over the last 5 decades. It was the lack of more recent data that made it imperative to conduct a perioperative mortality study in the largest teaching hospital in Zambia as a follow-up to the initial study. **Methods:** Over a 6-month period, all patients who died within 6 days after having undergone a surgical procedure with general, regional or combined anesthesia at the University Teaching Hospital (UTH) in Lusaka were prospectively identified. **Results:** A total of 9775 cases constituted the denominator, of which 449 were lost to follow-up. Seventy-nine patients were identified as having died during the study period. The overall 6-day inpatient perioperative mortality rate was found to be 0.81% (95% confidence interval 0.63–0.99). There was no statistically significant difference between this rate and that of Heywood, Wilson and Sinclair from 1987 (overall 6-day inpatient mortality rate of 0.75%) ($\chi^2 = 0.119$, 1 degree of freedom, $p = 0.73$). **Conclusion:** The perioperative mortality indices at UTH have not reduced in comparison to historical data from 30 years ago. This is contrary to global indices, which have shown a downward trend over the last 5 decades.

Smartphone use among residents, fellows and attendings (consultants) within the Pan-African Academy of Christian Surgeons (PAACS). *Alliance Niyukuri, Jennifer O'Connor.* From Kibuye Hope Hospital, Franck Ogden Medical School, Hope Africa University, Bujumbura, Burundi (Niyukuri); and the Bongolo Hospital General Surgery Department, Lebamba, Gabon (O'Connor).

Background: Mobile technologies have been identified as the leading driving technologies in education in Africa. Several reviews have also highlighted the roles of smartphone technology within the hospital workplace, including portability, rapid access to online information, use of medical mobile applications and multimedia resources. We sought to survey current smartphone technology use within surgical education and clinical duties. **Methods:** Thirty-two volunteer faculty members, 34 surgery residents and 2 fellows from 8 different hospitals throughout Africa participated in an online survey distributed via SurveyMonkey questionnaire. This study received institutional review board approval from the host site and several other training sites. **Results:** We received 80 responses. The majority of respondents were aged 31–40 years (54%) and male (84.4%). A total of 98% owned smartphones. The most used social media site was WhatsApp (81.9%), with 85% of respondents having also downloaded clinical reference apps at the time of the survey. Although only 29% of respondents could not complete their daily tasks without a smartphone, 39.4% sought information through their smartphone first when faced with a clinical question. **Conclusion:** Most of the respondents owned a smartphone, and many respondents consulted their smartphone first to find solutions to clinical challenges. While there are drawbacks to the use of a smartphone such as excessive smartphone interruptions, we recommend its use among faculty and trainees as both an educational tool and a clinical tool. We recommend extending this survey to a larger African surgical training college.