

Canadian Journal  
of **Surgery**

Journal canadien  
de **chirurgie**

Vol. 59 (3 Suppl 3) June/juin 2016  
DOI: 10.1503/cjs.007016

# **Bethune Round Table 2016 Conference on International Surgery**

**Halifax, Nova Scotia  
June 3–4, 2016**

**Abstracts**



**Procedures driving mortality rate: the experience of a teaching hospital in Mirebalais, Haiti.** *Hillary E, Jenny<sup>†</sup>, Deborah Jenny Chisa Robert<sup>‡</sup>, Alexis Bowder<sup>§</sup>, Luther Ward<sup>¶</sup>, Mac Lee Jean Louis<sup>‡</sup>.* From <sup>†</sup>Harvard Medical School, Boston, MA; the <sup>‡</sup>Boston Children's Hospital, Boston, MA; the <sup>¶</sup>Hopital Universitaire de Mirebalais, Haiti; the <sup>§</sup>University of Nebraska Medical Center, Omaha, NE; and the <sup>¶</sup>St. Boniface Hospital, Winnipeg, Man.

**Background:** A hospital in rural central Haiti recently developed a surgical department and residency, rapidly increasing access to surgical care in an underserved region. As surgical capacity grows, it is crucial to evaluate safety and prioritize quality improvement efforts. We examine the perioperative mortality rate (POMR) and the procedures that contribute most to mortality in this setting. **Methods:** We conducted an IRB-approved retrospective study of nonobstetrical surgeries performed at Mirebalais University Hospital between October 2013 and March 2015. Patient demographics and procedural data were retrieved from operative records, patient charts, and electronic medical records. POMR was defined as in-hospital intra- or postoperative deaths over the number of procedures. Mortality was discussed in weekly conferences. **Results:** During this 18-month period, 3166 procedures were performed. Of the 76 surgical ward deaths, full records could be obtained for 67 patients. Sixty-one of these deaths were intra- or postoperative (POMR = 1.9%), with an average patient age of 45.4 years and a male:female ratio of 37:31. Exploratory laparotomy and amputation accounted for the most deaths (laparotomy:  $n = 28$  [45.9%], procedure-specific mortality rate 16.3%; amputation:  $n = 9$  [14.8%], procedure-specific mortality rate 7.4%). Incision and drainage and fracture reduction/fixation were the third leading causes of mortality ( $n = 4$  [6.6%] each; procedure-specific mortality rates 4.8% and 1.2%, respectively). Direct cause of death was available for 41 patients, with sepsis being the leading cause (21 [51.2%]). **Conclusion:** As surgical capacity grows, monitoring the mortality rate and its driving factors is crucial to ensuring quality of care. Determining which procedures drive mortality helps target interventions to reduce mortality in low-resource settings.

**Using morbidity and mortality conference to understand factors impacting surgical outcomes in Rwanda.** *Egide Ababuje<sup>\*</sup>, Jennifer Rickard<sup>†</sup>.* From the <sup>\*</sup>University of Rwanda, Butare, Rwanda; and the <sup>†</sup>University of Minnesota, Minneapolis, MN.

**Background:** Surgical morbidity and mortality in LMICs is often higher than in high-income countries. However, there are few studies discussing factors contributing to adverse events in LMICs. Morbidity and mortality (M&M) conferences provide a way to review factors contributing to adverse events and strategize mechanisms to minimize future adverse events and to educate surgical trainees. **Methods:** Discussions from M&M conferences at a referral hospital in Rwanda were reviewed. Factors commonly associated with adverse outcomes were analyzed from discussion notes. **Results:** Over a 1-year period, there were a total of 2211 operations with 127 deaths. There were 23 M&M conferences with 56 patients discussed. Among these patients, there were 31 (55%) deaths, and 30 (57%) patients had an unplanned reoperation. Common diagnoses included gastrointestinal disease ( $n = 26$  [46%]), trauma ( $n = 14$  [25%]), and neoplasm ( $n = 8$  [14%]). Delays

were commonly cited factors: 38 (68%) patients had delays in presentation, 23 (41%) had delays in diagnosis, and 24 (43%) had delays to the operating room. Twenty-seven (48%) patients had a critical hospital resource missing, and poor nutritional status was a factor in 16 (29%) patients. Thirty-four (61%) patients presented with advanced disease. **Conclusion:** M&M conferences can be used as a quality improvement tool as well as an educational instrument in low-resource settings. Commonly cited factors associated with surgical morbidity and mortality in Rwanda included delays in patient presentation and diagnosis, advanced disease and missing resources. Local interventions to reduce delays in diagnosis and management could improve outcomes. Implementing systems-based changes to facilitate patients seeking medical care earlier is challenging, but necessary.

**Maternal deaths from caesarean section-related haemorrhage in Southern Gauteng, South Africa.** *Salome Maswime, Eckhart Buchmann.* From the University of the Witwatersrand, Johannesburg, South Africa.

**Background:** Haemorrhage remains the highest direct cause of maternal deaths in Africa. Maternal deaths from caesarean section-related haemorrhage have increased in South Africa since 2011. More than 70% of these deaths were avoidable. Our objective was to determine risk factors and avoidable factors associated with maternal deaths from caesarean section-related haemorrhage. **Methods:** This study was a retrospective audit conducted in 7 hospitals in Southern Gauteng of all maternal deaths from caesarean section-related haemorrhage between January 2013 and December 2014. The data were collected by a review of maternal death case records. **Results:** There were 17 maternal deaths from caesarean section-related haemorrhage and 123 251 deliveries. Risk factors included previous caesarean section, preoperative anaemia and abruptio placenta. Avoidable factors included delays of up to 12 hours to perform caesarean section, inappropriate intraoperative procedures, and deficient postoperative management. Most women died within 48 hours of the caesarean section. Surgical trauma and uterine atony were the main causes of bleeding. Five (29%) women died before the cause of bleeding was found. **Conclusion:** All the maternal deaths were avoidable. The health care worker factors suggest that more emphasis needs to be placed on improving the skill of recognising shock and the management of caesarean section-related haemorrhage.

**Efficacy of surgical simulation training in a low-income country.** *Gavin Tansley.* From Dalhousie University, Halifax, NS.

**Background:** Simulation training has evolved as an important component of postgraduate surgical education and has been shown to be effective in teaching procedural skills. Despite potential benefits to LMICs, simulation training is predominately used in high-income settings. This study evaluates the effectiveness of simulation training in 1 LMIC (Rwanda). **Methods:** Twenty-six postgraduate surgical trainees at the University of Rwanda, Kigali, Rwanda, and Dalhousie University, Halifax, Canada, participated in the study. Participants attended a 3-hour simulation session using a high-fidelity, tissue-based model simulating the creation of an end ileostomy. Each participant was anonymously recorded completing the assigned task at 3 time

points: prior to, immediately following and 90 days following the simulation training. A single blinded expert reviewer assessed performance using the Objective Structured Assessment of Technical Skill (OSATS) instrument. **Results:** Mean OSATS score improvement for participants who completed all assessments was 6.1 points (95% CI 2.2–9.9,  $p = 0.005$ ). Improvement was sustained over a 90-day period with a mean improvement of 4.1 points between the first and third attempts (95% CI 0.3–7.9,  $p = 0.038$ ). Simulation training was effective in both study sites, though most gains occurred with junior-level learners, with a mean improvement of 8.3 points (95% CI 5.1–11.6,  $p < 0.001$ ). Significant improvements were not identified for senior-level learners. **Conclusion:** This study supports the benefit for simulation in surgical training in LMICs. Skill improvements were limited to junior-level trainees. This work provides justification for investment in simulation-based curricula in Rwanda and potentially other LMICs.

**Barriers to participation in international surgical teaching collaborations: a qualitative study.** *Parisa Fallab, Mark Bernstein.* From the University of Toronto, Toronto, Ont.

**Background:** Access to adequate surgical care is limited globally, particularly in LMICs. To address this, surgeons are becoming increasingly involved in international surgical teaching collaborations (ISTCs), which focus on improving the number of surgeons in LMICs and their surgical skills. A qualitative descriptive study was conducted to examine barriers and facilitators for involvement in ISTCs. **Methods:** Semistructured interviews were conducted with a convenience sample of 92 surgeons, anesthesiologists, nurses, residents/fellows, and nonmedical professionals from the United States and Canada with varied involvement in ISTCs. The interviews were audiotaped and transcribed. Thematic content analysis was used for data evaluation. **Results:** Barriers to participating in ISTCs included 1) no academic career benefit, 2) lack of time, 3) financial risk, 4) family commitments, 5) poor organization/communication, 6) no direct call for volunteers, 7) minimal mentorship/exposure, 8) minimal support from colleagues, 9) responsibility to patients at home, and 10) emotional distress/fear. Additionally, some participants perceived surgery as less necessary than medical interventions and had concerns with the ethics/intentions of ISTCs. In regards to ISTCs, participants also called for a centralized/systematized process with designated leaders, a universal data bank of current efforts/progress, full-time administrative staff, public dissemination of knowledge, increased use of technology, and increased research on needs and outcomes. **Conclusion:** The results from this study show several barriers that inhibit participation in ISTCs. Concrete steps can be taken to remove these barriers and to increase involvement in ISTCs. This could lead to an improvement in the number of surgeons in LMICs and their surgical skills.

**Surgery in Africa Journal Club: a north-south e-learning collaboration for surgical residents in the COSECSA Region.** *Tara Harrop<sup>†</sup>, Eric O'Flynn<sup>†</sup>, Andrew Howard<sup>‡</sup>, Pankaj Jani<sup>§</sup>, Abebe Bekele<sup>¶</sup>, Brian Cameron<sup>\*\*</sup>.* From <sup>\*</sup>Surgery in Africa; National Health Service General Practice Registrar, England; the <sup>†</sup>Royal College of Surgeons in Ireland, Dublin, Ireland; College of Surgeons of East, Central and Southern Africa Collaboration Programme, Arusha,

Tanzania; the <sup>‡</sup>Hospital for Sick Children, Toronto, Ont.; the <sup>§</sup>University of Nairobi, Nairobi, Kenya; the <sup>¶</sup>Addis Ababa University, Addis Ababa, Ethiopia; and <sup>\*\*</sup>McMaster University, Hamilton, Ont.

**Background:** Surgery in Africa (SIA) is an online journal club format series of evidence-based medicine (EBM) review modules for membership (MCS) and fellowship (FCS) surgical residents of the College of Surgeons of East, Central, and South Africa (COSECSA). The purpose of this study was to evaluate participants' knowledge and attitudes to EBM after the course. **Methods:** There were 124 SIA course registrants, including MCS and FCS trainees. Routinely collected course data and resident feedback surveys from the 2015 academic year were reviewed and summarized. **Results:** Sixty (48%) trainees completed the precourse and postcourse test of EBM knowledge. Postcourse scores improved significantly from a mean of 14.1/30 ( $\pm 4.06$ ) to 19.5/30 ( $\pm 5.1$ ) ( $p < 0.001$ , paired  $t$  test). Of 59 trainees completing the postcourse survey, 96% rated the course quality as good/very good, 92% agreed their attitude toward evidence-based practice had changed, and 98% agreed that the modules had a direct impact on their clinical work. Seven trainees copublished 1 SIA module discussion in a surgical journal. **Conclusion:** E-learning can support dispersed surgical trainees by removing geographic and time barriers, and is an effective approach to teaching evidence-based practice. Participant feedback about SIA was positive in terms of the quality of the resource and self-assessed impact on practice. However, there was a significant drop-out rate, with time pressures and inadequate Internet access, speed or cost cited as barriers to participation. Future research could focus on improving online social presence to support course participants in completing the course requirements, examination performance, and evidence-based practice.

**Ghana PrenaBelt Trial: an international, multidisciplinary collaboration.** *Allan Kember<sup>\*</sup>, Jerry Coleman<sup>†</sup>, Ali Borazjani<sup>‡</sup>, Heather Scott<sup>†§</sup>, Louise O'Brien<sup>¶</sup>, Michael Butler<sup>‡</sup>, Maxfield Okere<sup>‡</sup>, Jesse Wells<sup>\*</sup>, Sarah MacRitchie<sup>\*</sup>, Andre Isaac<sup>\*\*</sup>.* From the <sup>\*</sup>Global Innovations for Reproductive Health & Life, Cleveland, OH; <sup>†</sup>Dalhousie University, Halifax, NS; the <sup>‡</sup>Korle Bu Teaching Hospital, Accra, Ghana; <sup>§</sup>WK Women's Health Centre, Halifax, NS; the <sup>¶</sup>University of Michigan, Ann Arbor, MI; and <sup>\*\*</sup>Innovative Canadians for Change Foundation, Edmonton, Alta.

**Background:** In obstetrics, it is well-known that when a pregnant woman assumes the supine position, maternal cardiovascular parameters and fetal oxygenation are altered, occasionally causing significant fetal heart rate changes, particularly during labour. Recently, 3 studies, including 1 from members of our team (Coleman, O'Brien), have suggested that maternal supine sleep position may be a risk factor for stillbirth and low birth weight. The present study seeks to determine the effect of treatment with positional therapy during sleep in the third trimester on birth weight. **Methods:** We conducted a double-blind, sham-controlled, randomized trial at the Obstetrics and Gynecology Department, Korle Bu Teaching Hospital, Accra, Ghana. The team was multidisciplinary, comprising clinicians (obstetricians, midwives, respirologist), engineers, students, and academic researchers across 4 countries. We recruited 162 healthy pregnant

women in the third trimester (recruited at 26–30 wk) who met the following criteria: ages 18–35; low-risk singleton pregnancy; body mass index < 35; and no known fetal abnormality, obstetric complications, or medical conditions that complicate sleep. Participants were randomized to treatment with either PrenaBelt or sham-PrenaBelt. PrenaBelt is a maternal positional therapy device that affects subtle pressure points on the back of the user when she lies supine. Each participant was instructed to wear her device every night for the remainder of her pregnancy. **Results:** Interim analysis at the half-way point ( $n = 41$  births in each group) showed no difference in birth weight between the groups. Completion of data collection and final analysis are expected in May 2016. **Conclusion:** Avoiding supine sleep during pregnancy may be a novel approach to reducing the rates of stillbirth and low birth weight.

**Harmonization of academic surgical and anesthesia collaborations in Uganda: the Global Partners in Anesthesia and Surgery experience.** *Cathy Kilyewala<sup>†</sup>, Michael Lipnick<sup>‡</sup>, Nathan O'Hara<sup>§</sup>, Doruk Ozgediz<sup>¶</sup>, Gerald Dubowitz<sup>‡</sup>, Arlene Nakanwagi<sup>‡</sup>, Janat Tumukunde<sup>‡</sup>.* From the <sup>†</sup>Makerere University College of Health Sciences, Kampala, Uganda; the <sup>‡</sup>Department of Surgery, College of Health Sciences, Kampala, Uganda; the <sup>§</sup>University of San Francisco, San Francisco, CA; the <sup>¶</sup>University of British Columbia, Vancouver, BC; and <sup>¶</sup>Global Partners in Anesthesia and Surgery, Kampala, Uganda.

**Background:** As the number of global health initiatives has increased in recent years, so has competition for limited resources and duplication of efforts. In Uganda alone, there are approximately 10 000 nongovernmental organizations, including many foreign university-led global health initiatives. Surgery and anesthesia are areas that have lacked a global voice and been neglected by the global health community. Therefore, within these specialties, mechanisms to promote harmonization are especially important. Through a Uganda-based academic collaboration, Global Partners in Anesthesia and Surgery (GPAS), we established collaborative processes aimed at bringing together stakeholders and increasing the impact of global surgery efforts locally in Uganda. **Methods:** Four meetings (San Francisco, Vancouver, Hamilton, and Kampala) were hosted between 2010 and 2015, each with 100–225 participants representing the Ugandan Ministry of Health, 20 academic institutions and professional organizations from East Africa, North America and Europe. The meetings included presentations, expert panel discussions, small group sessions and original scientific abstracts and posters. **Results:** Participants identified priority areas, including promoting collaboration, workforce building and retention, rural services expansion, local research capacity building, and promoting surgical advocacy. Outputs since have included the hiring of a local coordinator in Uganda to promote harmonization among local and international stakeholders; creation of postgraduate academic positions for Ugandan surgical, obstetric, orthopedic and anesthesia graduates to promote workforce retention; support of biomedical technicians training; and development of a research agenda. **Conclusion:** Promoting harmonization among surgical and anesthesia stakeholders in Uganda is challenging but has produced several positive programmatic outputs and remains an important priority among local and international stakeholders.

**Neonatal surgery in a developing country: the impact of coordinated interdisciplinary collaboration.** *Sebastian Ekenze<sup>\*</sup>, Victor Modekwe<sup>†</sup>, Obinna Ajuzieogu<sup>\*</sup>, Uchebukwu Ezomike<sup>\*</sup>, Jubril Sanusi<sup>\*</sup>.* From the <sup>\*</sup>University of Nigeria Teaching Hospital, Enugu, Nigeria; and the <sup>†</sup>University Teaching Hospital, Nnewi, Nigeria.

**Background:** Disparity still exists in the outcome of neonatal surgery between high-income countries and LMICs. This study analyzed the management challenges and outcome of neonatal surgery before and after the introduction of focused interdisciplinary team management in 2013. **Methods:** We retrospectively analyzed neonatal surgery undertaken at the University of Nigeria Teaching hospital, Enugu, Nigeria, between December 2009 and November 2015. Cases managed prior to January 2013 (group A) were compared with those managed after January 2013 (group B). **Results:** There were 91 cases (47 in group A and 44 in group B). The common surgical conditions were oesophageal atresia ( $n = 21$ ), anorectal malformation ( $n = 18$ ), intestinal atresia ( $n = 18$ ), abdominal wall defects ( $n = 8$ ), and obstructed hernia ( $n = 8$ ). The surgical conditions, birth weight, age at presentation, and associated anomalies did not differ between the groups. There were 12 preterm neonates (9 in group A and 3 in group B,  $p > 0.05$ ), and postoperative complications in 43 (47.3%) cases (55.3% in group A and 38.6% in group B,  $p > 0.05$ ). After an average follow-up period of 7 months (range 1 mo to 4 yr), mortality was 35.2% (46.8% in group A and 22.7% in group B,  $p < 0.05$ ). Causes of mortality were unremitting sepsis (11 in group A and 5 in group B), anaesthesia complications (5 in group A and 0 in group B), and respiratory complications (6 in group A and 5 in group B). Delayed presentation and inadequate facilities were challenges in both groups. **Conclusion:** Despite persisting challenges, there was modest improvement in outcomes of neonatal surgery in our setting with coordinated team management. Addressing these challenges may further improve outcomes.

**Surgical care in Eastern Democratic Republic of Congo: a tertiary referral hospital's experience.** *Thomas Diehl<sup>†</sup>, Luc Kalisya Malemo<sup>†</sup>, Dan Deckelbaum<sup>\*</sup>, David Bracco<sup>\*</sup>, Katie Diehl<sup>†</sup>, Cito Kwiratwiwe<sup>†</sup>, Pascal Habamungu<sup>†</sup>, Tarek Razek<sup>\*</sup>.* From <sup>\*</sup>McGill University, Montreal, Que.; and <sup>†</sup>HEAL Africa, Coma, Democratic Republic of Congo.

**Background:** Access to essential surgical care is a top priority in global health. Developing targeted interventions that boost access to surgical care necessitates understanding current surgical availability and use. This study aimed to describe the availability and use of surgical services in Eastern Democratic Republic of Congo (DRC) by implementing an electronic surgical database at a tertiary referral hospital. **Methods:** Data were collected at HEAL Africa in Goma, DRC, using a tablet-based core operative database developed at the Centre for Global Surgery, McGill University Health Centre, Montreal, Canada. We performed a retrospective (Jan. 1, 2015 to June 30, 2015) and prospective (July 1, 2015 to Dec. 8, 2015) review of surgeries. **Results:** During the study period, 1521 cases were recorded. The patient population represented 7 of 11 provinces. Patient demographics and surgical statistics are outlined in the table. Data acquisition was found to be feasible and required 1 minute per case. **Conclusion:** Tablet-based databases are a relatively simple, cost-efficient method of

collecting surgical data and stimulating research in remote, low-income settings. Obstetric/gynecological and orthopedic surgery are highly used surgical services in Eastern DRC. Obstetrical emergencies account for the region's largest proportion of emergent operations. Regional referral patterns are not clearly defined. Surgical electronic databases are an invaluable tool to match training requirements and resources in LMICs.

**Table 1. Patient demographics and surgical statistics**

Parameter	Mean $\pm$ SD or %
Age, yr	26.6 $\pm$ 18.2
Sex ratio, % male:female	35.3:64.7
Operative category	
Elective	61%
Urgent	29%
Trauma-related	10%
Reason for emergency	
Obstetrical	83%
Infection	6%
Obstruction/perforation	8%
Ischemia	2%
Hemorrhage	2%
Anesthesia	
General	38%
Neuraxial	57%
Locoregional	5%
Airway technique (general anesthesia)	
Endotracheal intubation	87%
Laryngeal mask airway	2%
Spontaneous breathing	11%
Surgical subspecialty	
Obstetrics/gynecology	33%
Orthopedics	26%
General surgery	14%
Plastic surgery	9%
Urology	8%
Otolaryngology/ophthalmology	6%
Neurosurgery	4%

**Surgical service delivery at Port Moresby General Hospital, Papua New Guinea: a cost-effective intervention.** *Danlop Akule Awasano\**, *Josh Bleicher†*, *Osborne Liko‡*. From the \*Port Moresby General Hospital, Port Moresby, Papua New Guinea; the †University of Iowa, Iowa City, IA; and the ‡National Department of Health, Port Moresby, Papua New Guinea.

**Background:** A Cost-effective analysis is considered a useful tool to guide resource allocation decisions. However, there is little evidence on the cost per disability-adjusted life year (DALY) averted by health facilities in many LMICs. A cost-effectiveness analysis of surgical service delivery at Port Moresby General Hospital (PMGH), the only major multidiscipline and referral hospital in Papua New Guinea with a high trauma burden and a much larger setting than those in other LMICs, has never been attempted before. **Methods:** Using the method by McCord and Chowdhury (*Int J Gynaecol Obstet* 2003;81:83–92) and modified by Gosselin et al. (*World J Surg* 2006;30:505–11; *World J Surg* 2008;32:2450–3), cost per DALY averted by the surgical division was calculated. Estimated opera-

tional cost, pharmaceutical cost and staff wages with DALYs averted for 921 patients undergoing 900–1000 surgical procedures over a 3-month period was calculated. **Results:** Estimated total costs was K4 725 399.14 (US\$1 653 889.70) and total DALY averted was 5683, resulting in a cost/DALY aversion of K831.53 per DALY (US\$291.03). Apparently, trauma accounted for 45% of cost per DALYs averted (US\$131). Results are comparable to those of the few existing studies done in other LMICs and to other nonsurgical health interventions. **Conclusion:** At a cost of US\$291.03 per DALY averted, surgical service delivery is cost-effective and compares favourably to other nonsurgical public health interventions, contrary to common perception that surgical care is too expensive a strategy to implement in LMICs, and hence deserves prioritization as a public health intervention to prevent disabilities and improve trauma care in Papua New Guinea.

**Pediatric spinal anesthesia in Madagascar.** *Jean Heuric Rakotomalala\**, *Dan Poenaru†*, *Gustave Randianandrasana‡*. From the \*Manambaro Lutheran Hospital SALFA & Bethany Kids, Mahajanga, Madagascar; †McMaster University, Hamilton, Ont.; and the ‡Lutheran Hospital SALFA, Mahajanga, Madagascar.

**Background:** Spinal anesthesia is common in low-resource settings, but its use in children is infrequent. Primary applications include groin and abdominal procedures, and wherever general anesthesia is contraindicated or not preferable. This is a report of pediatric spinal anesthesia in Madagascar, documenting its efficacy and safety. **Methods:** This was a retrospective study of pediatric patients (age 0–19 yr) who underwent surgical interventions under spinal anesthesia between 1991 and 2013 at a single referral institution in a remote Malagasy region. Information collected included demographic data, surgical interventions, procedure duration, and intra- and postoperative complications. **Results:** Out of 13 088 surgical interventions performed over 22 years, 1704 (13%) were pediatric, and 281 (2.2%) were performed under spinal anesthesia. This included 12 infants younger than 5 years, 49 age 6–10 years, and 165 age 11–15 years. The most common procedures were appendectomy (51.1%) and inguinal hernia repair (26.9%); other procedures included circumcision, hydrocele repair, orchidopexy, exploratory laparotomy, and open cholecystectomy. Procedures lasted 7–80 minutes. Complications included 67 cases (64 intraoperative and 3 postoperative) of mild hypotension (< 70/40 mm Hg) and 8 cases of postoperative headache. **Conclusion:** Spinal anesthesia is a generally safe procedure in low-resource settings. Mild hypotension is the most common complication and is addressed with prehydration and intraoperative fluids. The anaesthetist's skills, both technical and in reassuring the pediatric patient, are essential.

**Establishment of a multidisciplinary thyroid disease management program in Gambia: a multinational collaboration.** *Saffie Jammeh\**, *Gareth Eeson†*, *Buba Sanyang‡*, *Aliou Badjie‡*, *Matthew Eckfeldt‡*, *Catharine Eckfeldt‡*, *Deborah Brauer§*, *Jon Just§*. From the \*Edward Francis Small Teaching Hospital, Banjul, Gambia; the †University of Toronto, Toronto, Ont.; the ‡Serrekunda General Hospital, Serrekunda, Gambia; and §Medicos en Accion, Gambia.

**Background:** Thyroid disease, including endocrine dysfunction, visible goitre and malignancy, remains highly prevalent in West

African populations. Both dietary and genetic factors have been etiologically implicated. Specialized services for the management of thyroid disease were previously unavailable in Gambia, leaving a notable unmet need. The purpose of this study was to establish a national multidisciplinary clinic to increase access to care, enhance understanding of local disease burden and to improve the management for thyroid disease in Gambia. **Methods:** A national thyroid program was established through a multinational partnership (Gambia, Canada, Netherlands). Data for all patients assessed through the thyroid program were prospectively collected (2012–2015). Standard descriptive statistics were used for analysis and reporting. **Results:** Clinical services were established to provide outpatient assessment, medical management, surgery and postoperative care/surveillance. Ninety-eight patients were assessed (92 female, 6 male, mean age 37.7 yr). All patients were referred for visible goitre, 47% of which were non-toxic multinodular goitres, 28% were toxic multinodular goitres, 4% were solitary nodules, 7% were Grave's disease and 14% were "other." Thyrotoxicosis was present in 40% of patients at initial assessment, yet less than 5% of patients were receiving appropriate medical therapy. Thyroidectomy was performed in 29 patients (52% total, 45% hemithyroidectomy, 3% subtotal thyroidectomy). At time of last follow-up, all patients were disease-free as per surgical indication, with complications occurring in 3 patients (1 major, 2 minor). **Conclusion:** The establishment of a national multidisciplinary clinic through a multinational collaboration has led to improved education, access to care and management of thyroid disease in Gambia.

**The incidence of postoperative pulmonary complications after major abdominal surgery and associated risk factors in Rwanda.** *Gaston Nyirigira\**, *Théogène Twagirumugabe\*\**. From the \*Butare University Teaching Hospital, Butare, Rwanda, and the †University of Rwanda, Butare, Rwanda.

**Background:** More than 230 million major surgical procedures are performed annually worldwide. Postoperative complications associated with these surgeries impose significant clinical and economic burdens on patients and public health systems. Pulmonary complications (PPCs) are common and occur in 2%–40% of surgical patients. There are few studies of PPCs in LMICs, where resources are limited and patient characteristics differ from those of patients in North America and Europe. The purpose of this study was to examine the incidence and predictors of PPCs in Rwanda, an LMIC in Africa. **Methods:** This prospective cross-sectional study examines the incidence of PPCs in adult abdominal surgical patients under general anesthesia. Patients undergoing minor surgery or reoperative procedures and those with pre-existing respiratory problems were excluded. Following institutional REB approval, 230 patients were enrolled in the study. Patients were assessed 1 hour postoperatively and on postoperative days 1, 3 and 7. PPCs were considered to be present if there was postoperative hypoxemia (SpO<sub>2</sub> < 90% on oxygen). The etiology of PPCs (e.g., pneumonia, atelectasis) was determined by chest x-ray, transthoracic echo, complete blood count and/or clinical assessment. **Results:** Of 230 participants, PPCs occurred in 54 (23.5%) patients. PPCs included atelectasis (11.7%), pneumonia/acute respiratory distress syndrome (5.2%) and pulmonary edema (2.6%). Risk factors for PPCs included cigarette smoking, pre-existing pulmonary diseases, absence of

nasogastric tube (when indicated but unavailable) and inadequate postoperative pain management. **Conclusion:** The incidence of PPCs after major abdominal surgery in Rwanda is 23%. Findings highlight the need for a strong focus on preoperative assessment, optimization and adequate postoperative pain control.

**Laparoscopic versus open cholecystectomy: a cost-effectiveness analysis at Rwanda Military Hospital.** *Allison Silverstein\**, *Ainboa Costas Chavarri†*, *Mussa Gakwaya‡*, *Joseph Lule‡*, *Mark G. Sbrime§*. From the \*University of Miami Miller School of Medicine, Miami, FL; †Human Resources for Health Rwanda, Rwanda; ‡Rwanda Military Hospital, Kigali, Rwanda; and §Harvard Medical School, Boston, MA.

**Background:** Laparoscopic cholecystectomy is first-line treatment for gallstone disease in high-income countries owing to benefits such as shorter hospital stays, reduced morbidity, more rapid return to work, and lower mortality. Despite such benefits, laparoscopy in LMICs remains limited, largely owing to economic concerns. Thus, there is urgent need to determine the value of laparoscopic cholecystectomy compared to an open approach in LMICs. **Methods:** A deterministic cost-effectiveness analysis evaluating laparoscopic and open cholecystectomies at Rwanda Military Hospital (RMH), a referral hospital in Rwanda, was conducted using TreeAge Pro 2015 software. Decision tree event pathways were modelled in consideration of RMH resources. After initial results, sensitivity and threshold analyses were performed to determine the strength of the recommendations. **Results:** The laparoscopic and open cholecystectomy costs and effectiveness values were \$2889.97 with 0.87 QALYs and \$2058.72 with 0.75 QALYs, respectively. The incremental cost-effectiveness ratio (ICER) was 6787.51. Sensitivity and threshold analyses confirmed these results as robust. The probabilistic sensitivity analysis demonstrated that a laparoscopic cholecystectomy is favorable at willingness to pay (WTP) thresholds greater than \$5200. If the investment cost for equipment was not included, laparoscopy was more cost-effective. **Conclusion:** The results from RMH demonstrate that while laparoscopic cholecystectomy may be a more effective approach, it is also more expensive. At the WTP threshold of 3 times the gross domestic product, the open approach is recommended. Overall, the ICER warns against newly implementing laparoscopic cholecystectomy in this setting. However, in settings where equipment donations allow hospitals to evade investment costs, a laparoscopic approach may become favorable.

**Maximizing value for money of donated surgical equipment in low-income countries.** *Dinsie Williams\**, *Andrew Howard†*, *Jillian Kobler\**. From the \*University of Toronto, Toronto Ont.; and the †Hospital for Sick Children, Toronto, Ont.

**Background:** In low-income countries, such as Ghana and Sierra Leone, there is a pervasive shortage of functional equipment that severely hampers the capacity of surgeons to treat patients. Transnational donors provide funds for almost 80% of medical equipment in these countries. Yet, approximately 70% of available equipment remains unused, abandoned. We will identify the factors that contribute to accumulation of unusable, donated surgical equipment, examine policy options to address this issue,

and identify opportunities to optimize the value of donated equipment. The work presented is a doctoral thesis in preparation. Interim results of the case study will be presented at the Bethune meeting. **Methods:** Case study methodology will include a review of policy or guideline documents and surveys, and key informant interviews will inform the case study. The unit of analysis will be a participant. **Results:** Both the document review and a substantial number of key informant interviews will have been completed and analyzed in time for the conference. Institutional documents will be assessed for clarity, completeness, and relevance to their specific environment of use. From the survey responses and interviews, 2 reviewers will use open coding to identify words, concepts, and ideas relevant to accountability and access to health care. **Conclusion:** Findings from the study will be useful to policymakers interested in improving health care delivery by enhancing utility of donated medical equipment. The proposed study is novel because it addresses the issue of ineffective donation programs using a balanced approach informed by the perspectives of both recipients and donors.

**Diagnostic and treatment delay among patients with breast cancer at a tertiary hospital in Sub Saharan Africa: an observational study.** *Samuel Kirunda, Moses Galukande, Rose Alenyo, Timothy Makumbi, Margaret Nansubuga, Anne Wesonga, John Yiga, Job Kuteesa, Brenda Anena.* From Makerere University, Kampala, Uganda.

**Background:** Breast cancer is one of the most prevalent female cancers in the world. In Uganda, it is the third most common female cancer and its incidence is rising. Effective treatment has been proven to prolong survival when started early. This study, therefore, examined the time and factors related to delay in confirming diagnosis and initiating oncological treatment. **Methods:** A prospective, descriptive study, patients with a histological diagnosis was consecutively sampled and followed up. The main study variable was the time taken to start any indicated oncological treatment. The study was carried out at a tertiary hospital from June 2014 to March 2015. **Results:** We recruited 73 patients; 70 (96%) were females, the overall mean age was 46 years, 30 (41%) had formal schooling and 64 (87.7%) had advanced disease (stage III and IV). The median diagnostic and treatment delays were 84 and 20 days, respectively. Thirty-nine (51.4%) cancers were diagnosed within 3 months, 14 (19.4%) between 3 and 6 months, and 20 (27.2%) after 6 months from the first presentation. In total, 31.7% had started oncological treatment 6 months from the first presentation. Factors attributed to the diagnosis and treatment delays included poor sample quality (needing repeat biopsies), lack of operating theatre space, and delayed staging investigations. **Conclusion:** The total delay period was excessive and likely to have an adverse effect on final survival outcomes.

**Estimating unmet surgical need in rural Tanzania.** *Gregory Knapp\*, Alex Ernest†, Marius Hoogerboord‡, Robyn Traynor‡.* From the \*Global Surgery Office, Dalhousie University, Halifax, NS; the †University of Dodoma, Dodoma, Tanzania; and the ‡Nova Scotia Health Authority, Halifax, NS.

**Background:** It is estimated that 143 million additional procedures are needed in LMICs each year to save lives and prevent disability. However, there is a dearth of region-specific data on

unmet surgical need. The aim of this study is to estimate the unmet need for essential surgical services in rural Tanzania. **Methods:** Surgical volume can be used to estimate unmet need based on minimum volume targets. Esquivel et al. (2015) proposed that 5000 procedures per 100 000 is the minimum surgical volume to meet the basic surgical needs of a population. We will conduct a retrospective review of operating theatre logbooks from all public and private facilities in the rural Tanzanian provinces of Iringa and Dodoma. Total surgical volume, including procedure type, patient age, sex and hospital location (urban v. rural), for both provinces will be captured for a 12-month period (Feb. 8, 2015 to Feb. 8, 2016). Population data will be gathered from current census data. **Results:** Descriptive statistics on case mix, age, sex, and geographic distribution will be presented. The total surgical volume for Iringa and Dodoma province will be produced as a rate per 100 000. This will be compared to the basic rate of 5000/100 000 to generate an estimate of unmet surgical need in rural Tanzania. **Conclusion:** Basic descriptive statistics on surgical volume are lacking in many LMICs. This information, along with an estimate of unmet need, is critical for regional and national stakeholders to better advocate for appropriate resource allocation, policy reform and curriculum development.

**Recurrence of post-burn contractures of the elbow and shoulder joint: experience of a Ugandan hospital.** *Darius Deo Balumuka\*, George Galiwango†, Rose Alenyo‡.* From the \*Mbarara University of Science and Technology, Mbarara, Uganda; the †CoRSU Hospital, Kisubi, Uganda; and ‡Makerere University, Kampala, Uganda.

**Background:** Recurrence of post-burn contractures (PBC) is associated with multiple operations and an increased cost to patients and their families. The purpose of this study was to determine the frequency of recurrence of PBC of the shoulder and the elbow joint 3 months after surgical intervention and the associated risk factors. **Methods:** This was a prospective cohort study conducted at CoRSU hospital from March 2012 to November 2014. Data were collected using a pretested, coded questionnaire. A goniometer was used to measure the active range of motion of the involved joint. **Results:** Fifty-eight patients were enrolled consecutively in the study. There were 36 females and 22 males. The average age at the time of injury was 3.4 years. The most common cause of initial burn injury was scalding. The average number of joints involved per patient was two. There was a high incidence of recurrence of PBC (52%) among the participants. The shoulder had the highest frequency of recurrence at 67%. The elbow joint had a frequency of recurrence of 27%. All participants with both elbow and shoulder joint involvement had PBCs recur (100%). Risk factors for recurrence were flame burn ( $p = 0.007$ ), duration of contractures of more than 1 year ( $p = 0.018$ ) and residual contractures ( $p = 0.002$ ). **Conclusion:** Recurrence of PBCs of the elbow and shoulder joint is a common problem. Risk factors should be kept in mind during the management of PBCs.

**Population-level spatial access to pre-hospital transport and emergency surgical services in Ghana.** *Gavin Tansley.* From Dalhousie University, Halifax, NS.

**Background:** LMICs account for 90% of the world's injury-related deaths. The majority of these deaths occur in the prehospital setting

due, in part, to insufficient trauma care capacity. Targeted expansion of services is a potentially cost-effective means to improve trauma care in LMICs. In collaboration with the National Ambulance Service (NAS) in Ghana, this study describes the population-level spatial accessibility of prehospital transport and emergency surgical services to inform service expansion. **Methods:** Geographic information science (GIS)-based routing methods were used to evaluate access to the 128 NAS stations and the 11 hospitals capable of providing emergency surgical care in Ghana. A 2-step floating catchment area (2SFCA) model identified district-level variability in access to the NAS. **Results:** The proportion of Ghana's population serviceable within 60 minutes of an NAS station was 78% (uncertainty interval [UI] 74.8%–80.3%). Population-level spatial access to reliable emergency surgical care within 60 minutes was considerably lower at 49% (UI 42.1%–54.2%). This proportion decreased to 38% (UI 33.5%–43.4%) when prehospital transport by the NAS was incorporated into the model. In addition to identifying 7 particularly underserved districts, the 2SFCA model identified considerable variation in district-level ambulance/population ratios, which ranged from 0.05 to 2.43 ambulances per 100 000 persons (median 0.45, interquartile range 0.23–0.63). **Conclusion:** Currently the capacity of emergency services in Ghana is most limited by the availability of facilities capable of providing reliable surgical care. The use of GIS-based methods to inform service expansion might serve as a model for other LMICs attempting to improve the equity of trauma care.

**Biomedical equipment as a barrier to access of essential surgical care in LMICs.** *Alison Wong, Kelly Jacob, Madeline Wilson, Stacie Zwolski, Dalia Abou Zeki, Soumyadipta Acharya.* From Johns Hopkins University, Baltimore, MD.

**Background:** Five billion people in the world do not have access to safe, affordable surgical and anaesthetic care, and the lack of working biomedical equipment exacerbates this issue. The World Health Organization estimates that only 30%–60% of biomedical equipment is fully functional, yet little is currently understood about what can be done to improve its availability. **Methods:** In-country ethnographic observations and qualitative interviews were conducted with health care professionals and technicians at all levels of care (tertiary, secondary, and primary or district hospitals) in Zambia and Ethiopia. A supplemental online survey (ongoing) was created to further elucidate common themes regarding access to biomedical equipment across countries. **Results:** Results from the ethnographic research and interviews showed that there are numerous factors contributing to limited access to biomedical equipment necessary for safe surgical care. Many of these are systems-level issues surrounding the need for formalized procurement, sound contracts with manufacturers, and inventorying. At the hospital level, there is a lack of biomedical technician workforce, substantial gaps in the resources they have to repair equipment, and, similar to all professionals in rural communities, a lack outside support for complex problems. **Conclusion:** Functional biomedical equipment is needed to provide essential surgical care. Biomedical technicians are a largely overlooked cadre of professionals who are critical for not only the maintenance and repair of equipment, but also advising inventory and procurement decisions. Further research into how they can be supported is needed as it will benefit provision of surgery locally and allow for more informed equipment policies.

**Basic trauma course: efforts of a university teaching hospital at local capacity building.** *Joshua Ogundele.* From the University College Hospital, Ibadan, Nigeria.

**Background:** A basic trauma course aims at developing an understanding of the basic principles behind the initial management of trauma patients in our community. Resource persons include specialists from the surgical subspecialties. The objective of this study was to evaluate the effectiveness of the course in building the capacity of health care providers in our hospital and other health care facilities in our community. **Methods:** Opinions of health care providers in our teaching hospital and other health care facilities in the community who have participated in the basic trauma course were sampled to determine the effectiveness of the course at improving their capacity using a structured questionnaire. **Results:** Eighteen medical officers working in other health care facilities and 54 medical personnel from our hospital participated in the study. In total, 70 (97.2%) participants agreed that the objectives of the training were met, while 80.6% were satisfied with the content and depth of the training. In addition, 66 (91.7%) believed the training was useful and improved their capacity in caring for their patients, while 6 (8.3%) were undecided whether it added any benefits to their practice. Four (5.6%) participants strongly disagreed that the course increased their confidence in performing basic trauma surgical skills, 14 (19.4%) were undecided, and 54 (75%) agreed that it improved their confidence. **Conclusion:** Improved outcome of care of trauma patients is desirable in resource-poor settings like ours. All efforts must be concentrated to enhance the capacity of health care providers to meet these goals.

**Economics implications of delay presentation of children with intussusceptions in a Nigerian teaching hospital: minimizing health care cost in the context of limited resources.** *Abdulrasheed Nasir\*, David Nwosu\*, Kayode Bamigbola†, Lukman Abdur-Rabman\*, Aisha Gobir\*, James Adeniran\*.* From the \*University of Ilorin/University of Ilorin Teaching Hospital, Ilorin, Nigeria; and the †Federal Medical Center, Owo, Nigeria.

**Background:** A basic strategy in today's resource-limited health care environment is limiting cost while maintaining quality. This study estimated the impact and health care cost of treatment of intussusceptions presenting late. **Methods:** We performed a retrospective chart review of children managed for intussusceptions at the University of Ilorin Teaching between January 2012 and August 2015. Our care pathway included resuscitation, ultrasound guided hydrostatic reduction of children presenting early ( $\leq 24$  h) with no peritonitis or operative reduction for late presenters. **Results:** There were 46 children with median age of 8.5 months (interquartile range 6–13.3mo). Only 1 (2.1%) had national insurance scheme coverage, and 16 (41%) belonged to socioeconomic class III. Fourteen (30.4%) presented early ( $\leq 24$  h). The average total charge was higher for patients who presented late (\$259.6 v. \$169.2,  $p = 0.012$ ). There was an average of 21% (\$50.0) additional charges incurred for each day's delay. There were significantly higher cost of drugs (\$44.6 v. \$23.7,  $p = 0.010$ ) and procedures (\$150.5 v. \$100.1,  $p = 0.049$ ). Early presentation is less likely to be associated with operation intervention (64% v. 97%,  $p = 0.003$ , OR

0.270). There was an increased risk of bowel resection in those who presented late (40% v. 0%,  $p = 0.006$ , OR 1.778, 95%CI 1.310–2.413), and they had a higher complications rate (56% v. 21%,  $p = 0.029$ , OR 1.531, 95%CI 1.037–2.258). The length of stay was doubled for those who presented late (10.6 v. 4.6 d,  $p = 0.023$ ). **Conclusion:** Delayed presentation of intussusceptions translates to one-half total hospital cost and an extra week in hospital with utilization of limited resources and increased morbidity. Intervention focusing on behavioral modification to encourage early presentation is advocated.

**Ready, set, go! Follow-up from the 2014 Bethune Round Table Global Surgery Research Working Group.** *Julia Pemberton\**, *Dan Poenaru\**, *Miliard Derbew Beyene†*, *Vic Neufeld‡*, *Brian Cameron\**. From \*McMaster University, Hamilton, Ont.; †Addis Ababa University, Addis Ababa, Ethiopia; and the ‡Canadian Coalition for Global Health Research, Ottawa, Ont.

**Background:** A new Canadian Global Surgery Research Working Group (GSRG) was proposed by participants at a workshop during the 2014 Bethune Round Table in Hamilton, Ont. The GSRG's mandate is to build cross-discipline, and intersectoral research capacity, develop partnership collaborations, and set an agenda for priorities in global surgery research (GSR). This study details the progress and next steps necessary for putting this mandate into action. **Methods:** The action planning workshop transcript proposed 1) identifying GSR needs and priorities, 2) building technical research capacity by supporting surgical researchers from LMICs, and 3) expanding support for innovative knowledge production and dissemination through quality collaborative GSR. Thus far individual efforts have led to a number of GSR initiatives, but there is little ongoing national collaboration. **Results:** We propose initiation of the GSRG with representatives from the 6 global surgery offices in Canada, the College of Surgeons of East, Central and South Africa (COSECSA) and the Canadian Coalition of Global Health Research (CCGHR). The initial objectives will include 1) a mapping exercise and inventory of existing projects and researchers in GSR, 2) connecting COSECSA trainees with GSR mentors, 3) creation of a web-based portal (based on the CCGHR Harmonization portal), 4) submission of a CIHR planning grant proposal to support the first GSRG meeting, and 5) a group publication describing the goals and purpose of the GSRG. **Conclusion:** The implementation of the GSRG will contribute to enhancing collaborative evidence-based surgical practice in LMICs and ensure efficient appropriation of limited research resources for key global surgery priorities.

**Saving children's hearts: complex care model.** *Lucie Pivnick\**, *Lior Sasson†*, *Akiva Tamir†*, *Sion Hourvi†*, *Bernard Goldman‡*. From the \*Michael G. DeGroot School of Medicine, McMaster University, Hamilton, Ont.; the †Wolfson Medical Center, Holon, Israel, associated with Sackler School of Medicine, Tel Aviv University, Israel; and the ‡Sunnybrook Health Science Centre, University of Toronto, Toronto, Ont.

**Background:** Save a Child's Heart (SACH) is a global humanitarian surgical initiative aimed at improving the quality and accessibility of pediatric cardiac care. **Methods:** SACH provides a

continuum of care: a tertiary pediatric heart centre at the Wolfson Medical Centre (WMC) in Israel, partnerships in underserved regions for referral of patients to WMC, and the training of medical/surgical teams to establish local independent centres in developing regions. "Medical missions" assist partner sites in determining operability. Travel, surgery, perioperative stay, and follow-up are provided free. "Surgical missions" visit local centres to teach and upgrade surgical skills. **Results:** Since 1995, SACH has operated on 4000 children from 50 countries: 50% of children are from neighbouring Arab countries, despite regional tensions (Gaza, West Bank, Iraq, Jordan and Syria). Sixteen partnership sites have been established. More than 100 medical/surgical personnel have been trained in Israel and 4 independent surgical centres have been established (China, Tanzania, Moldova, Romania); 2 are in training (Ethiopia, Palestine Authority). Services are provided free to families. Funding is from governmental sources, private foundations, and affiliates. SACH is working with the Palestine Medical Complex in Ramallah to create an independent pediatric cardiac surgical program, funded by the EU and USAID; it is an example of cooperation between Palestine and Israel Ministries of Health. **Conclusion:** SACH has provided tertiary pediatric cardiac care by a hub-and-spoke relationship between the WMC, referral partners, and independent surgical sites in developing regions of Africa, Asia, Eastern Europe and the Middle East. SACH may be a model for other complex surgical endeavours.

**Addressing the barriers of oesophageal atresia in a developing country: impact of multidisciplinary team management.** *Sebastian Ekenze*, *Obinna Ajuzieogu*, *Uchebukwu Ezomike*, *Elochukwu Nwankwo*, *Jubril Sanusi*, *Augustine Onuh*. From the University of Nigeria Teaching Hospital, Enugu, Nigeria.

**Background:** We present our experience with oesophageal atresia (OA) following introduction of multidisciplinary team management and temporary preoperative feeding via gastrostomy and cardia banding in 2013. **Methods:** We performed a comparative analysis of cases of OA managed at the University of Nigeria Teaching Hospital, Enugu, Nigeria, from January 2009 to October 2015. **Results:** Eleven cases were managed from January 2009 to December 2012 (group A) and 8 cases from January 2013 to October 2015 (group B). Gestational age, associated major malformation, birth weight, and pneumonitis did not differ between the groups. There were differences in the age at presentation (median age 7 d in group A and 10.5 d in group B), age at definitive procedure (median age 11 d in group A and 27.5 d in group B), and weight gain following gastrostomy (mean 0.4 kg in group A and 0.7 kg in group B). Four (21.1%) cases had primary repair (2 per group), 6 (31.6%) had delayed primary repair after treatment of pneumonitis (4 in group A and 2 in group B), and 9 (47.3%) had delayed primary repair after gastrostomy (Stamm gastrostomy in 5 patients in group A and gastrostomy and cardia banding in 4 patients in group B). After an average follow up of 28 months (range 7–60 mo), 6 (31.6%) survived (1 of 11 in group A and 5 of 8 in group B,  $p < 0.05$ ). Mortality was due to uncontrolled sepsis ( $n = 5$ ), anesthesia complications ( $n = 4$ ), and respiratory complications ( $n = 4$ ). **Conclusion:** Delayed presentation is still a major challenge to the care of OA in our setting. Multidisciplinary team management, and gastrostomy with cardia banding to augment nutrition may improve outcome.

**Knowledge translation in global surgery.** *Gregory Knapp\**, *Robyn Traynor†*. From the \*Global Surgery Office, Dalhousie University, Halifax, NS; and the †Nova Scotia Health Authority, Halifax, NS.

**Background:** This study presents an analysis of the unique variables that define knowledge translation (KT) in global surgery using the Ottawa Model of Research Use (OMRU). **Methods:** The OMRU is a conceptual framework designed to plan and guide KT interventions. It assumes a nonlinear, nonsequential process by which research may be applied in practice, taking contextual factors and the dynamic interactions between involved parties into consideration. The 3 pillars of the framework include assessing barriers and supports, monitoring KT intervention implementation, and evaluating adoption and outcomes. The first pillar represents a targeted situational analysis, which includes assessment of the evidence-based innovation, the potential adopters, and the policy environment. **Results:** A broad-themed analysis for KT specific to surgical and anesthesia care in LMICs reveals numerous unique barriers and supports that require special consideration. Access to evidence-based medicine and relevant databases through targeted resource allocation, curriculum development and greater North–South partnership are critical to address potential adopter barriers. Workforce shortages and resource limitations can be leveraged as supports, and a focus must be placed on mapping the unique dynamics (i.e., power structures, research politicization, traditional practices) of the regional policy environments. Monitoring intervention implementation and evaluating adoption and outcomes must feed back into research generation. **Conclusion:** The most efficient translation of knowledge into action involves tailoring KT strategies to relevant barriers and supports. The OMRU is a useful framework for assessing, monitoring and evaluating the unique barriers and supports to knowledge translation in global surgery.

**Characteristics of road traffic collision patients presenting to the Emergency Department in Mirebalais, Haiti: a retrospective chart review.** *Henry Claude Eliacin\**, *Zanmi Lasante†‡*, *Malena Outbay†‡§*, *Cassandre Edmond†*, *Cheridor Evans\**, *Joshua Ng-Kamstra†‡¶*, *Shada Roubani†‡¶¶*, *Regan Marsh†‡¶¶*. From the \*Hopital Universitaire de Mirebalais, Arrondissement de Mirebalais, Haiti; †Harvard Medical School, Boston, MA; ‡Boston Children's Hospital, Boston, MA; §Vanderbilt University School of Medicine, Nashville, TN; ¶University of Toronto, Toronto, Ont.; ‡‡Brigham and Women's Hospital, Boston, MA.; and ‡‡Partners in Health, Boston, MA.

**Background:** Injury accounted for more than 3 million deaths and 200 million disability-adjusted life-years (DALYs) lost in 2011, with road traffic collisions (RTC) as a leading cause of injury. Currently, little data exist on characteristics of RTC victims in Haiti. We aim to provide such data from a new tertiary-level Emergency Department (ED) in Haiti. **Methods:** Using an electronic medical record, we conducted an IRB-approved retrospective audit of all patients who presented with trauma to the Mirebalais University Hospital between October 2013 and March 2014. Patients who presented more than 48 hours after injury were excluded. Data were analyzed in SAS software ver-

sion 9.3. **Results:** In total, 1416 confirmed trauma cases represented 18% of total ED visits during the study period. Among all patients, 45% (638 of 1416) suffered an RTC; 70% (447 of 638) involved motorcycles. Safety behaviours were documented in the paper record for 43% (273 of 638) of RTC patients; seat-belt use was noted in 30% (13 of 44) of patients and helmet use in 13% (31 of 229) of motorcycle traumas. Serious injury — defined as death in the ED, 2 or more days spent in the ED, admission, or need for surgery — was found in 21.5% (138 of 638) of RTC patients, significantly higher than in any other mechanism of trauma ( $p = 0.0015$ ). **Conclusion:** Almost half of trauma patients who presented to the ED suffered an RTC, with 5.6% of total ED visits due to motorcycle injury alone. RTC patients exhibited low compliance with safety behaviours and had high rates of serious injury. Efforts to reduce the burden of injury in Haiti must focus on creating and enforcing legislation surrounding road traffic safety.

**Deferred surgical intervention among pediatric patients in Tanzania: reasons for delays in presentation and surgical care.** *Danielle LeBlanc\**, *Laura Sacier†*, *Sherry Wren†*, *Dan Poenaru‡*. From the \*Department of General Surgery, Memorial University, St. John's, NL; †Department of General Surgery, Stanford University, Stanford, CA; and the ‡Department of Surgery McGill University Health Centre, Montreal, Que.

**Background:** Delays in both presentation and surgical intervention are common in Africa and have been associated with considerable morbidity and mortality. We aimed to categorize and quantify factors that affect these delays. **Methods:** Prospective data were collected over a 3-month period from pediatric patients presenting to a tertiary referral hospital with emergent nontraumatic surgical disease. Using a modified “3-delay” model, delays were categorized as relating to initial care-seeking behaviour (delay 1), delays in diagnosis and transfer to tertiary facility (delay 2), and delays in definitive care at the facility (delay 3). Chart review and caregiver interviews were extracted for demographics, history of presenting illness, care-seeking behaviours, and delays observed. **Results:** Data were collected on 118 patients, including 39 caregiver interviews. Median overall delay varied widely between 6 days for acute abdomen and 314 days for surgical oncology. For the average patient, delay 2 accounted for 69% of the total delay, followed by delay 1 (17%) and 3 (14%). Prior to definitive care, 82% of patients had presented to 3 or more health care facilities; 36% had also consulted traditional healers, although only 6% had done so as the first point of care. Key reasons for delayed presentation included financial constraints; health care provider and resource limitations; and errors in the diagnosis, referral, and treatment processes. **Conclusion:** Provision of surgical care is often significantly delayed among pediatric patients in Tanzania. Prehospital delays within the health care system are key contributors, thus highlighting areas of most effective potential interventions aimed at improving overall quality of children's care.

**Impact of international collaborations on surgical training in a setting with limited resources: 10-year review of surgical residency at University of Rwanda.** *Faustin*

*Ntirenganya\**, *Robert Riviello†*, *Georges Ntakiyiruta\**. From the \*University of Rwanda, Butare, Rwanda; and the †Brigham & Women's Hospital, Boston, MA.

**Background:** The lack of human resources significantly hinders the functioning of health systems in LMICs; therefore, training is essential. Training specialists in African universities offers advantages as specialization is more suitable to local needs, common local health problems are emphasized, the country benefits from the services of the physician during his/her specialization, and the risk of brain drain is minimized. **Methods:** The University of Rwanda and Ministry of Health made an appreciable effort to train surgeons locally. This training started formally in 2005 as a 4-year Masters of Medicine in Surgery. However, the pace was slow owing to small numbers of local faculty. We report a 10-year review of surgical residency at University of Rwanda. **Results:** A number of international academic collaborations have been leveraged to maximize the training capacity — most notably through the Rwanda Human Resources for Health Program, which began in 2012. Our report reveals how through international collaborations and partnerships the training program has increased the number of trainees and graduates in a relatively short time. In 10 years, 17 surgeons graduated, and 50 more are in training. From a single Masters of Medicine in Surgery program, 4 specialty training programs been developed. Currently, the University of Rwanda offers specialized training in general surgery, orthopedic surgery, neurosurgery and urology, with a capacity to enrol 20 residents every year. **Conclusion:** In Rwanda, international collaborations and partnerships have been vital to increase the number of surgical trainees and surgeons in a relatively short time.

**Outcome of bloodless surgeries in a collaboration between the University of Calabar Teaching Hospital, Nigeria, and the Atlanta Medical Center, USA.** *Nathaniel Usoro\**, *Emem Akpabio\**, *Emmanuel Japbet\**, *Onyebuchi Osakwe\**, *Teresa Edentekbe\**, *Marcus Inyama\**, *Henrietta Olukoya\**, *Etim Ekanem\**, *Brenda Depena-Gray†*. From the \*University of Calabar Teaching Hospital, Calabar, Nigeria; and the †Atlanta Medical Center, Atlanta, GA.

**Background:** Transfusion avoidance is associated with improved outcome. This study reviews the outcome of bloodless surgeries at the University of Calabar Teaching Hospital (UCTH), Nigeria, in collaboration with the Bloodless Medicine & Surgery Program (BMSP) at the Atlanta Medical Center (AMC), USA. **Methods:** All patients referred to the Bloodless Surgery Program (BSP) in UCTH from January to December 2015 were studied. Surgeries were performed by the primary surgeons, while the BSP managed the perioperative blood conservation techniques for each patient. Hemocue was used. Age, sex, diagnosis, surgery, blood conservation techniques, hemoglobin, length of stay, morbidity and mortality data were collected and analyzed using Microsoft Excel. **Results:** Twenty-two patients were referred to the BSP in UCTH. Twenty patients had surgery; patients' age was 19–76 years (mean 36 yr), and there were 19 females and 1 male. There were 10 obstetric cases, 7 gynecology, 2 general surgery,

and 1 orthopedics. There were 13 elective cases and 7 emergencies. Tranexamic acid was administered in all 20 cases, intravenous iron and erythropoietin in 13, vitamin K in 12, colloids in 9, tourniquet in 5, diathermy in 2, and acute normovolemic hemodilution in 1. Hemoglobin range preoperatively was 7.3–13.9 g/dL (mean 11.7 g/dL), postoperative day 3 was 4.4–12.4 g/dL (mean 11.4 g/dL) and at discharge was 6–12.9 g/dL (mean 9.4 g/dL). Length of stay was 4–15 days (mean 8 d). There were no deaths. **Conclusion:** Collaboration between UCTH and AMC facilitated critical education in bloodless surgery and provided a model for the structure of the BSP in UCTH. Bloodless surgery is a “win-win” in developing countries as it improves outcome, avoids transfusion transmitted infections and reduces cost.

**Impact of multidisciplinary team and regional collaboration on the care of children with disorders of sexual differentiation in north-central Nigeria.** *Abdulrasheed Nasir\**, *Lukman Abdur-Rabman\**, *Anthony Oyekunle†*, *Omotayo Adesiyun\**, *Majeed Adegboye\**, *Moses Olanrewaju\**, *Deborah Alonge\**, *Kayode Bamigbola‡*, *Temitope Obasa\**, *Adesola Adesiyun\**, *Sikiru Biliaminu\**, *Benjamin Bolaji\**, *James Adeniran\**. From the \*University of Ilorin/University of Ilorin Teaching Hospital, Ilorin, Nigeria; the †Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Nigeria; and the ‡Federal Medical Center, Owo, Nigeria.

**Background:** This study evaluated the role of multidiscipline and regional collaboration in the care of children with disorders of sexual differentiation (DSD) at University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria. **Methods:** The records of all patients diagnosed with DSD by the Division of Pediatric Surgery, UITH, Nigeria between January 2011 and October 2015 were retrospectively reviewed. The care pathway included clinical, laboratory (polymerase chain reaction/karyotype at another region, gonadal biopsy), internal evaluation (imaging, laparoscopy and cystoscopy), and panel (including parents) evaluation and consensus. **Results:** Thirteen children presented at a median age of 12 months (interquartile range [IQR] 13 d to 6 yr). Six (46.2%) patients were raised as boys, 5 (38.5%) as girls and 2 (15.4%) had uncertain gender identity. Final diagnosis was ovotesticular DSD 7 (12.8%; 5 with 46,XY and 2 with 46,XX); 46,XX DSD in 2 (15.4%); 46,XY DSD in 2 (15.4%); and 2 (15.4%) awaiting final diagnosis. Gender assignment was male for 8 (61.5%; of the 8 males, 6 were ovotesticular [4 with 46,XX, 1 with 46,XY, and 1 without karyotype] and 2 were 46,XY DSD). Gender assignment was female for 4 (30.8 %; 2 with 46,XX CAH and 1 with 46,XX ovotesticular DSD, and 1 without karyotype). Two cases raised as female were reassigned male. There were no discordant views between panel and parents. Median age at definitive gender assignment and genital surgery (8 urethroplasty and 4 feminizing genitoplasty) was 4.5 years (range 3 mo to 11 yr). Seven patients had procedure-related complications (6 Clavien–Dindo grade III and 1 death [Clavien–Dindo grade V]) at a median follow-up of 12 months (IQR 4–22 mo). **Conclusion:** Access to laparoscopy, gonadal histology, PCR/karyotype and multidisciplinary team evaluation have assisted in demystifying the barriers to optimal care of children with DSD.