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Partnerships in Global Surgery: Do Short-Term Surgical Teams Increase Operative Volume?
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Scientific Area: Global Surgery
Clinical Area: Cross-cutting or N/A

Introduction: Short-term surgical teams (STSTs) offer the potential to increase surgical capacity, provide specialty services and create educational opportunities for local staff. They also often gain exposure to advanced pathology, improved physical examination skills and practice patterns with limited resources from experienced local providers. In the absence of outcome data, STSTs often use productivity as a metric of impact. We set out to determine whether STSTs increase operative volume at an NGO hospital in rural Haiti.

Methods: We retrospectively reviewed the operative log at an NGO hospital in rural Haiti from Jan 1st, 2013 through July 1st, 2014. We compared the mean number of operations performed on weekdays when STSTs were present and absent. We also analyzed the relative contributions of STSTs and local staff surgeons to the operative volume.

Results: The sample included 1976 operations completed over 399 weekdays. During the study period, 53 individuals comprising 22 STSTs were present for 118 of the 399 weekdays (29.6%). STSTs were associated with a modest increase in operative volume (5.83 vs. 4.58 operations/day, p=0.0024) that accounted for approximately 100 additional procedures per year. STSTs did not perform as many operations as the local staff did during their stays (2.11 vs. 3.72 operations/day, p=0.0001). STSTs were also associated with a decrease in local staff productivity (3.72 vs. 4.58 operations/day, p=0.025).

Conclusion: STSTs were associated with a modest increase in operative volume partially mitigated by a decrease in local staff productivity. STSTs offer many benefits to hospitals in LMICs, but must be well coordinated and integrated into existing systems to maximize potential benefits.
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Measuring Surgical Outcomes in Rural Haiti: Choosing a Target for Quality Improvement
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Introduction: The lack of outcome data is a barrier to quality improvement efforts in resource poor settings. Most hospitals in LMICs endure several resource constraints and do not include outcome measurement in routine data collection. We set out to systematically record inpatient surgical outcomes for an eight-month time period at a typical rural NGO hospital in rural Haiti to inform future quality improvement efforts.

Methods: A single data collector used a standard set of definitions to prospectively record outcomes during any admission or readmission for adult and pediatric general and orthopedic surgical patients from Sept 16th, 2013 to May 16th, 2014. Primary outcomes included all cause mortality, post-operative mortality, surgical site infection, and unplanned repeat operations. Secondary outcomes included length of stay and reasons for re-admission.

Results: The cohort included 1088 patients and 1165 admissions. The surgical caseload consisted of 1022 operations performed on 864 patients. All-cause mortality occurred in 1.52%, post-operative mortality in 1.45%, SSIs in 2.47%, and unplanned repeat operations in 1.40% of cases. The 30-day readmission rate was 7.1%. Median Length of stay (LOS) for all patients was 4 days. Median LOS for patients with diabetic foot ulcers was 30 days. Readmissions were due to complications in 50% of cases.

Conclusions: Measuring outcomes should precede attempts at quality improvement in order to identify the most relevant interventions. For this hospital, we identify inpatient wound care as a target for quality improvement and encourage the development of outpatient metrics to more fully characterize surgical quality.
Estimating Global Access to Surgical Care with Geospatial Mapping of Surgical Providers

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Scientific Area: Global Surgery  
Clinical Area: Cross-cutting or N/A

Introduction: The Lancet Commission on Global Surgery calls for universal access to safe, affordable and timely surgical care. Unfortunately, billions of people currently lack access to such care due to myriad factors including severe deficits in the surgical workforce. Little is known, though, about the distribution of surgeons and their accessibility to patients in low-resource settings -- this makes allocation of human and physical resources challenging. Geospatial mapping can be used to (1) identify populations that lack timely access to surgical care (defined as living within two hours of a surgical provider) and (2) understand variations in surgeon-to-population density that can impact service availability.

Methods: The number and practice location of surgeons was obtained from Ministries of Health, professional societies, registration databases, personnel with in-country knowledge of surgeon distribution, and the published literature. Spatial distribution of providers was mapped using online mapping software. Two-hour driving zones were constructed around each provider location through analysis of roads and driving times calculated from Google Maps. The number of people living within these zones was estimated using the Socioeconomic Data and Applications Center Population Estimation Service.

Results: Analysis was completed on data from nine countries: Mongolia, Namibia, Papa New Guinea, Sierra Leone, Somaliland, Zimbabwe, nine states in Nigeria, six states in India, and one state in Ecuador. Percentages of populations living within two hours of a surgical provider vary dramatically, ranging from 4.7% (Chhattisgarh state, India) to 88.6% (Ogun state, Nigeria). Surgeon-to-population ratios ranged from 1:10,500 (Mongolia) to 1:1,360,000 (rural Kerala state, India). Surgeon-to-population ratios also vary dramatically within the same country. In Sierra Leone, for example, the urban surgeon-to-population ratio was 1:80,900 compared to the rural surgeon-to-population ratio of 1:383,000.

Conclusion: Access to surgical care in the resource-limited setting is contingent upon multiple factors. The most fundamental of these is availability of and access to a surgeon. Geospatial mapping of surgical providers shows that regardless of national surgical numbers, many populations in the world still lack access to timely surgical care. Wide variability in timely and available access exists between and within countries. Geospatial mapping has the unique ability to illustrate coverage gaps in a meaningful way. Understanding these access patterns can prove useful in addressing national deficits in surgical care.
Improving Surgical Capacity in a Low Resource Setting: the Rwanda Human Resources for Health Program

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Scientific Area: Global Surgery
Clinical Area: Cross-cutting or N/A

Introduction: There is an estimated shortage of approximately 7.2 million health care workers worldwide, with critical shortages in sub-Saharan Africa. These shortages are largely due to lack of sufficient quality medical education programs, limited faculty and infrastructure, and difficulty retaining trained professionals. This deficit is particularly noticeable in surgery, which is often forgotten in global health discussions. Surgical missions, isolated trainings by surgical volunteers, and task shifting have played important roles as short-term solutions. However, these vertical programs are unable to fill the workforce gap in resource-limited countries. For these countries to sustainably manage the volume of their unmet surgical need, an emphasis needs to be placed on capacity building.

Methods: Instead of small-scale cooperative efforts between stand-alone academic institutions or isolated individuals, the Human Resources for Health (HRH) program was created in Rwanda in 2012 as a long term plan to increase the quality and quantity of health care professionals in the country. The HRH program is a seven-year partnership between the Rwandan Ministry of Health, the United States federal government, and a consortium of 23 US institutions (USI) dedicated to building sustainable health care capacity. USI faculty are recruited to work full-time for one year in Rwanda and are partnered directly with Rwandese colleagues. Since August 2012, 10 USI surgeons a year (including general, plastics, orthopedic and pediatric surgery) have been active participants in surgical clinical and didactic teaching, curriculum and residency program development, research support and trainee mentorship.

Results: The HRH program is unique in many ways but perhaps none more so than its attention to surgical education as a critical component of a thriving health care delivery system. The HRH faculty have been instrumental in the improvement of education practices including clinical bedside and operative teaching, establishing protected didactic time, regular educational lectures and conferences such as morbidity and mortality, and research mentoring. Greater appreciation has developed as well for surgery as a complex system and the importance of the many components needed to run a successful surgical program. HRH surgeons have thus assisted in the creation of separate specialty surgical services, streamlining operating room efficiency, procuring necessary and adequate instruments, providing teaching to ancillary staff, and highlighting the importance of having adequate radiology and pathology services.

Conclusion: The HRH Program surgical faculty, in partnership with their Rwandan colleagues, have provided formal surgical instruction and mentoring in Rwanda since 2012. In doing so, they are helping to improve the quality and capacity of the Rwandese surgical workforce so that it may comprehensively and sustainably meet the country’s future healthcare needs.
A Nationwide Survey of Access to Surgical Facilities, Poverty, and Deaths from Acute Abdomen in India

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Scientific Area: Global Surgery
Clinical Area: General Surgery

Introduction: Acute abdominal conditions, including appendicitis, peptic ulcer disease, and incarcerated hernias are associated with high mortality in the absence of timely surgical care. In India, limited country-specific data exists to quantify the burden and distribution of deaths from acute abdomen (DAA) and to guide the development of surgical services. In this study, we describe the spatial and socioeconomic distributions of DAA and quantify potential access to surgical facilities in relation to such deaths.

Methods: Data on DAA throughout India in 2001-2003 were obtained from the Million Death Study (MDS), a nationally representative, population-based mortality survey of 1.1 million Indian households using verbal autopsy methodology. We created a national spatial database of abdominal mortality by integrating data from the MDS with surgical provider and facility data from the District-Level Household and Facility Survey and household socioeconomic data from the Special Fertility and Mortality Survey. The spatial distribution of DAA was calculated using ordinary kriging, and cluster analysis was performed using the Getis-Ord Gi* statistic. This provided ‘hot’ and ‘cold’ clusters of DAA at the postal (PIN) code level. Spatial metrics of access and socioeconomic indicators were then evaluated to compare hot and cold spots of DAA.

Results: 923 of 85388 study deaths in those aged 0-69 years were identified as DAA, representing an estimated 1.1% proportional mortality. The majority of deaths occurred at home (71%) and in rural areas (87%). The mean age-standardized DAA mortality rate was 8.6 times higher in hot than in cold PIN codes. Hot spots were associated with poorer access to district-level hospitals (DH) with a full complement of surgical resources. The median distance to the nearest such hospital was 53 km [IQR 32-85] in hot spots versus 27 km [IQR 17-43] in cold spots. Poverty indicators were also associated with mortality. Median monthly total household expenditure was significantly lower in hot spots versus cold spots, as were adult literacy rates. The proportion of households belonging to a scheduled caste or tribe was significantly higher in hot versus cold spots.

Conclusions: DAA were concentrated in rural India and predominantly occurred outside of a health facility. Mortality was associated with poor geographic access to surgical care, poverty, and belonging to a scheduled caste or tribe. These findings support the need to improve timely access to well-resourced surgical facilities in India to prevent avertable mortality from common surgical conditions. Policies must also address the significant socioeconomic barriers to surgical care, especially for the rural poor in India.
Age-standardized death rates: acute abdominal conditions

Getis-ord Gi* cluster analysis, Indians aged 0 to 69 years
Variability of Surgical Mortality in Low and Middle Income Countries: Meta-Review of Published Data

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Scientific Area: Global Surgery
Clinical Area: General Surgery

Introduction: WHO estimates that low income countries accounting for nearly 35% of the global population receive only 3.5% of all operations. Increased attention has focused on scaling up surgical services, yet post-operative mortality in these settings is unknown but likely to be high. Quantifying postoperative mortality is important to assess challenges in scaling up surgical services and improving care.

Methods: We performed a systematic literature review using Embase, Web of Science, Medline, SCOPUS and Google Scholar to identify articles reporting on mortality following cesarean section, appendectomy and groin hernia repair in low and middle income countries (LMICs) as defined by the World Bank. We included articles published since 2000 that reported mortality following one of these interventions, regardless of preoperative status, indication for intervention, or cause of death. We discarded duplicate analysis of the same data, reports on less than 10 operations, and laparoscopic-only studies. We aggregated studies by country to create larger data samples for analysis.

Results: Our initial literature search identified 1255 citations. After exclusion criteria, 203 required full-text review and 129 contained data for extraction. Forty two out of 116 LMIC published data on at least one of the predefined operations. We calculated crude post-operative case fatality rates (CFR) per country for each intervention. CFR ranged from 0 to 51.7 (mean=11.4) per 1000 operations for cesarean section, 0 to 88.6 (mean=13.5), per 1000 operations for appendectomy, and 0 to 411.8 (mean=39.9) per 1000 operations for hernia repair. This represents a 20, 5 and 15 fold increase in mean postoperative mortality when compared to Netherlands, a country with historically low CFR (cesarean section 0.58, appendectomy 3.03, and hernia repair 2.78 per 1000 operations).

Conclusion: Although these estimates do not control for comorbidities, demographics, or facility factors, our findings suggest tremendous variability in mortality following surgical intervention in LMIC. The excessive high death rates following essential surgical interventions indicate safety concerns that demand prompt attention.
Rectal bleeding and hidden colorectal diseases in Nepal: A cross sectional countrywide survey
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Scientific Area: Global Surgery  
Clinical Area: General Surgery

Introduction: Because rectal bleeding is a cardinal symptom of many colorectal diseases including colorectal cancers, its presence alone could give insight into the prevalence of these conditions where direct population screening is lacking. In South Asia, which is home to over one fifth of the world's population, there is paucity of epidemiologic data on colorectal diseases, particularly in the lower-income countries (LIC) such as Nepal. The aim of this study is to enumerate the prevalence of rectal bleeding in Nepal and increase understanding of colorectal diseases as a health problem in the South Asian region.

Methods: A countrywide survey utilizing the Surgeons OverSeas Assessment of Surgical Need (SOSAS) tool was administered from May 25\(^{th}\) to June 12\(^{th}\) 2014 in 15 of the 75 districts of Nepal, randomly selected proportional to population. In each district, three Village Development Committees were selected randomly, two rural and one urban based on the Demographic Health Survey methodology. Individuals were interviewed to determine the period and point prevalence of rectal bleeding, and patterns of health-seeking behavior related to surgical care for this problem. Individuals aged over 18 were included in this analysis.

Results: A total of 1350 households and 2,695 individuals were surveyed with a 97% response rate. Thirty-eight individuals (55% male) of the 1,941 individuals 18 years and older stated they had experienced rectal bleeding (2.0%, 95% CI 1.4% to 2.7%), with a mean age of 45.5 (SD 2.2). Of these 38 individuals, 30 stated they currently experience rectal bleeding. Healthcare was sought in 18 participants with current rectal bleeding, with 2 major procedures performed, one an operation for an anal fistula. For those who sought healthcare but did not receive surgical care, reasons included no need (4), not available (6), fear/no trust (5) and no money for healthcare (1). For those with current rectal bleeding who did not seek healthcare, reasons included no need (1), not available (2), fear/no trust (6) and no money for healthcare (4). Twenty-four individuals had an unmet surgical need secondary to rectal bleeding (1.2%, 95% CI 0.8% to 1.8%).

Conclusion: The Nepal healthcare system at present does not emphasize the importance of surveillance colonoscopies or initial diagnostics by a primary care physician for rectal bleeding. Our data demonstrate limited access for patients to undergo evaluation of rectal bleeding by a healthcare professional, and that potentially there are people in Nepal with rectal bleeding that may have undiagnosed colorectal cancer. Further advocacy for preventative medicine and easier access to surgical care in LIC is crucial to avoid emergency surgeries, advanced stage malignancies or fatalities from treatable conditions.
Designing an International Partnership to Improve Surgical Training in a Low-Income Country

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Scientific Area: Global Surgery
Clinical Area: General Surgery

Introduction: Sub-Saharan Africa has the lowest number of surgeons per population in the world. Mozambique has 0.2 general surgeons per 100,000 people whereas the United States has 7 per 100,000. Mozambique’s few attending general surgeons are not only involved in the training of surgical residents but also in the education of “tecnicos de cirurgia,” non-physician surgical specialists that address Mozambique’s surgeon shortage by performing operations in provincial and district hospitals where surgical care would otherwise be unavailable. The expense and expertise required to improve surgical training are major barriers to increasing surgical capacity in low-income countries. In this study, we reviewed general surgery admissions and operative logs to guide international academic partnership efforts to improve surgical training in Mozambique.

Methods: A retrospective review was performed of all general surgery logbooks and ward discharge records from August 2012 to August 2013 at a large tertiary care hospital in Mozambique. Local and international partners reviewed the data to identify strategies for improving surgical training and delivery of surgical care.

Results: 2,617 inpatient records and 1,598 major surgical procedures were reviewed. Of patients undergoing surgery, 58% were male and mean age was 39 years. The mortality rate of patients treated in the department was 5.6%, and the mean age of deceased patients was 49 years. Most common conditions contributing to death were sepsis (23%) and HIV (14%). Of 688 elective procedures, the most commonly performed were hernia repair (29%), breast surgery (12%), hemorrhoidectomy (9%), and amputations (9%). Of 910 emergency procedures, the most frequently performed were appendectomy (15%), hernia repair (13%), amputation (12%), and incision and drainage (12%). Overall, 153 (17%) of emergency operations performed were for traumatic injuries. Of the 30 cases involving spleen trauma, 87% resulted in splenectomy. No standardized trauma resuscitation protocol was identified; CT-scan and ultrasound are not routinely available. 36% of hernias were repaired as emergencies. No laparoscopic procedures were performed.

Conclusion: International partners can support surgical programs in low-income countries by providing funding and expertise to improve surgical skills and research. We recommend a needs-assessment approach in order for collaborative efforts to be contextually appropriate. For Mozambique, these training projects could address the development of a trauma and critical care system, the improvement of the availability of imaging, earlier referral and treatment of hemorrhoids and hernias, and the introduction of minimally invasive treatment strategies to address limited bed space and operative capacity. Our experience could serve as a model for international collaborations focused on increasing surgical capacity and supporting surgical training in other low-income countries.
Introduction: Rural Guatemalans face obstacles limiting healthcare access that are common to impoverished, remote communities: lack of financial resources, limited transportation, discrimination, language barriers, and fear of unfamiliar health centers. Delivering surgical care within these remote communities is challenging. We hypothesized that delivery of sustainable surgical treatment is possible through coordination between existing Guatemalan health promoters and visiting surgical teams.

Methods: A general surgical team and translators from International Surgical Missions (ISM; Pueblo, CO) have joined with Asociación Compañero Para Cirugía (ACPC, local health promoters) in San Juan Sacatepéquez, Guatemala, through Partners for Surgery (PFS) in October 2012 and 2013. PFS is a volunteer organization that provides sustainable access to surgery and medical care by connecting indigenous Guatemalan communities and international volunteer teams. In advance, health promoters screened remote villages for individuals with surgical complaints. Those identified were transported, along with their family members, to a converted surgical center with communal living quarters. A Guatemalan family physician performed basic screenings and tests. ISM provided instruments, medications and surgical care.

Results: Data from the October 2012 mission were reviewed. Two general surgeons and two surgical residents performed pre-operative histories and examinations on seventy-seven potential surgical candidates identified by ACPC. Sixty-six patients (85.7%) were deemed appropriate candidates and underwent surgery over six operative days. Forty-eight cases (72.3%) were performed under general anesthesia. Fourteen laparoscopic cholecystectomies were performed without open conversion. Patients recovered in adjacent living quarters and were transported back to villages. Health promoters continue visiting villages to identify new surgical patients and anyone with post-operative issues. Patients in need of surgical attention are transported back to converted surgical center and evaluated by incoming surgical teams.

Conclusion: Sustainable delivery of surgical care in remote Guatemalan regions is possible through coordinated local and international efforts.
Humanitarian Skill Set Acquisition Trends Among Graduating U.S. Surgical Residents, 2003-2013
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Scientific Area: Global Surgery
Clinical Area: General Surgery

Introduction: While interest in practicing surgery in resource-constrained settings is on the rise among graduating U.S. surgical residents, there is ongoing debate about an optimal humanitarian skill set for surgeons who chose to work in such settings. In addition, increased emphasis on general surgery case exposure at the cost of specialty surgery case exposure has been documented, and may have a negative impact on the breadth of resident training. Review of general surgery resident case logs to gauge experience in specialty surgery may provide insight into residents’ readiness for work in resource-limited settings.

Methods: We compared Accreditation Council for Graduate Medical Education general surgery resident case logs from 2003 and 2013 for operations thought to be essential for working in resource-constrained settings. Case numbers for specialty operations were compared by unpaired t-test analysis between the two time periods.

Results: Case averages in hand, pediatric, genitourinary, and gynecologic surgery decreased significantly from 2003 to 2013 (range 22-51%; p<0.0001). Orthopedic surgery case averages were unchanged, and plastic and general abdominal surgery case averages increased (range 30-44%; p<0.0001).

Conclusion: Case mix among graduating U.S. surgical residents has narrowed over the past 10 years. Resident experience in a variety of specialty fields, thought to be essential in resource-constrained settings, decreased markedly over the study period. Residents who intend to work in resource-constrained settings may need to craft individualized residency experiences or pursue post-graduate training in specialty surgery courses to best prepare for such work.
Massive Pleural Fluid Collection in Adult Nigerians: Aetio-epidemiologic Profile and Outcome

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Scientific Area: Comparative Effectiveness/Patient-Centered Outcomes
Clinical Area: Cardiothoracic

Introduction: To determine the aetiology and incidence and, comparing the mortality of malignant with non-malignant massive pleural effusion (MPE) in our setting

Methods: Prospective study of all the patients diagnosed of massive pleural effusion for one year in two tertiary federal hospitals in southern part of the country, Nigeria. Forty-eight of 101 consecutive patients with MPE and required Chest Tube Drainage and chemical pleurodesis for malignant MPE. The patients were followed-up two weekly at clinic and phone calls

Results: Forty-eight patients (47.5%) had MPE with a mean age of 43 years + 14.04; 35 were females and 13 were males with a ratio of 2.7:1. The cardinal symptoms were dyspnoea in 97.7%, cough in 79.1%, chest pain in 48.8% and weight loss in 39.5%. Eighteen patients (37.5%) had malignancy (11 from metastatic breast cancer and 7 in others). Thirty patients (62.5%) were diagnosed of non-malignant conditions - 21 (44.9%) from pulmonary tuberculosis. Haemorrhagic effusions were from Malignancy in 12 (30.8%), pulmonary tuberculosis in 6 (15.4%) and trauma in 3 (7.7%); straw-coloured effusion were from malignancy in 9 (23.1%), pulmonary tuberculosis in 8 (20.1%). Eight of 14 patients diagnosed of malignant MPE died within 6 months. Compared with non malignant MPE, patients with malignant MPE had higher mortality (8/14 versus 0/23 with a p value of 0.000).

Conclusion: Pulmonary tuberculosis and Malignancy are the major contributors to the high incidence of MPE. The presentation of an adult patient with non traumatic haemorrhagic or straw-coloured MPE in this sub-region narrows the diagnosis to pulmonary tuberculosis and malignancy with malignant MPE being marker for short survival rate of 6 months.
14.12 - ASC20151217

The Epidemiology of Gastrochisis in Zimbabwe in 2013

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Scientific Area: Global Surgery
Clinical Area: Pediatrics

Introduction: Survival for infants with gastrochisis in developed countries has improved dramatically in recent years with mortality rates of 4-7%. Conversely, mortality rates for gastrochisis in Sub-Saharan Africa remain dismal at 40-60%. This study aimed to describe the burden of gastrochisis for the major pediatric hospital in Zimbabwe and to identify pre- and post-admission factors associated with in-hospital survival.

Methods: We sorted the electronic records at Harare Children's Hospital for abdominal wall defects (ICD-9 756.7) and cross-referenced the subsequent list with the local neonatal unit register. Paper records for these cases were retrieved from the 5,585 admissions to the neonatal unit in 2013, and clinical data was transcribed into a RedCAP database. Univariate analysis of gastrochisis patients was performed using SAS, and odds ratios were calculated to compare patients who survived versus died.

Results: 95 infants with gastrochisis were admitted to Harare Children’s Hospital in 2013. The minority(42%) were male, the mean birth-weight was 2208g, and the mean gestational age was 36 weeks. Mean maternal age was 19 years. Ninety-one newborns were outborn (outside of Harare Children’s Hospital), 78 born outside Harare Province, and 25 at home. The time from birth to admission was 11 hours (median 6.5). Eighty of 95 patients died (84.2%). The odds of survival were significantly decreased for infants weighing less than 2,500 grams (OR 0.15, 95%CI: 0.05-0.51), for those born at less than 36 weeks gestation (0.06, CI: 0.01-0.50), and for those born to teenage mothers (0.05, CI: 0.01-0.46). The odds of survival trended towards being decreased for those born before arrival to a hospital (0.16, CI: 0.02-1.34) and for those born outside Harare Province (0.35, CI: 0.10-1.22).

Conclusion: Gastrochisis mortality at Harare Children’s Hospital (84%) is associated with a number of factors that are well known to increase the risk of infant mortality such as low birth weight and prematurity. The high mortality rate observed in this population, however, is also likely due to a number of potentially modifiable factors. These data highlight an important opportunity for the development of innovative approaches to prenatal diagnosis, transportation, nutritional support, surgical management, and augmentation of the existing neonatal and surgical workforce.
Can Economic Performance Predict Pediatric Surgical Capacity in Sub-Saharan Africa?

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Scientific Area: Global Surgery
Clinical Area: Pediatrics

Introduction: The relationship between economic status and pediatric surgical capacity in low and middle income countries (LMICs) is poorly understood. In sub-Saharan Africa (SSA), Nigeria accounts for 20% of the population, and has the highest Gross Domestic Product (GDP), but whether this economic advantage has translated to increased pediatric surgical capacity is unknown. This study compares the pediatric surgical capacity between Nigeria and other countries within the region.

Methods: The Pediatric Personnel, Infrastructure, Procedures, Equipment and Supplies (PediPIPES) survey, a recent tool that is useful in assessing and comparing the capacity of health facilities to deliver essential and emergency surgical care (EESC) to children, was conveniently distributed to surgeons throughout sub-Saharan Africa. Descriptive statistics were computed.

Results: In this report, data from hospitals in Nigeria (n=24) and hospitals in 18 other sub-Saharan African countries (n=26) were compared, as in Table 1:

Conclusion: Despite better economic indicators in Nigeria, there were no distinct advantages over the other countries in the ability to deliver EESC to children. Attention to developing pediatric surgical capacity in SSA remains poor, highlighting the urgent need for more resources for pediatric surgical capacity building efforts across the entire region.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Nigeria (%)</th>
<th>Other (%)</th>
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<tbody>
<tr>
<td>GDP (millions of US dollars)</td>
<td>522,638</td>
<td>37,771*</td>
</tr>
<tr>
<td>Hospitals with ≥1 Pediatric Surgeon</td>
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<td>58</td>
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<tr>
<td>Running Water Not Available</td>
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</tr>
<tr>
<td>No endoscope (esophagoscope/ bronchoscope/ cystoscope)</td>
<td>58</td>
<td>42</td>
</tr>
</tbody>
</table>

GDP values from Gross Development Product 2013 World Bank Report

*Average GDP of the other 18 sub-Saharan African countries
A Collaborative Experience in Caring for Infants Born with Esophageal Atresia in Belize

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Scientific Area: Global Surgery
Clinical Area: Pediatrics

Introduction: Children born with congenital anomalies in low-income countries often face a multitude of challenges. Access to pediatric surgical services is limited due to a lack of medical facilities, an adequate transportation system, and a lack of trained surgeons, anesthesiologists, and nurses, all of which leads to a high mortality rate. This is a report of a 5-year collaborative effort between the World Pediatric Project (WPP), the Children’s Hospital of Richmond (CHoR) at Virginia Commonwealth University, and multiple organizations within the country of Belize to provide care for infants born with esophageal atresia (EA).

Methods: After IRB approval, we reviewed medical records of children with EA treated in conjunction with the World Pediatric Project, which is a nonprofit organization that provides tertiary surgical care to children in Central America and the Caribbean. From 2009-2014, neonatologists and pediatric surgeons at our institution have collaborated with the WPP to care for infants born in Belize with EA. Six infants with EA (five also with an associated tracheoesophageal fistula) were transferred to our institution for surgical repair.

Results: A total of six infants, two boys and four girls, have been transferred to our institution for operative correction of their EA. After the first patient was transferred to our institution, multiple opportunities for improving the process were identified. A protocol was created to help diagnose infants with EA, outline initial management, and facilitate obtaining travel documents. At the time of transfer, their ages ranged from 2 weeks to 2 months old. All six of the patients had gastrostomy tubes placed in Belize prior to transfer for decompression of their stomach and placement of a venous catheter for TPN after arrival. Of the five infants with TEF, two underwent open repair and three had a thoracoscopic repair. The infant with a pure atresia underwent thoracoscopic converted to open repair. There were no peri- or post-operative complications. All six infants were orally fed post-operatively and were transferred back to Belize where they are thriving. Pediatric surgeons from CHoR see them annually.

Conclusion: Caring for infants born with congenital anomalies, specifically EA, can be challenging requiring the cooperation of a variety of specialties, including pediatric surgeons, neonatologists, pediatricians, and nutritionists. These challenges become even more complex with infants born in low-income countries. This report demonstrates how newborns with EA\textsuperscript{1}\textsuperscript{-}TEF in a developing country can be successfully transferred to the US, receive medical and surgical care, and return to their country. While this endeavor is challenging, the process can be facilitated by having a protocol in place, a well-organized local nonprofit organization, and a hospital that is committed to providing international care to children.
14.15 - ASC20150845

Prevalence of injuries due to falls in Nepal: A countrywide population based survey
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Scientific Area: Global Surgery
Clinical Area: Trauma/Critical Care

Introduction: An estimated 424 000 fatal falls occur globally each year, making it the second leading cause of unintentional injury-related deaths after road traffic injuries. Over 80% of fall-related fatalities occur in low- and middle-income countries, with regions of the Western Pacific and South East Asia accounting for more than two thirds of deaths. Data from low-income South Asian countries like Nepal are lacking, particularly at the population level.

Methods: A nationally representative cross-sectional study was performed in 15 of the 75 districts in Nepal, randomly selected proportional to population, using the Surgeons Overseas Assessment of Surgical Needs (SOSAS) survey tool. Three villages were randomly selected within each district, one urban and two rural. The SOSAS survey is divided into two portions: (1) demographic data including the household's access to healthcare and recent deaths in the household and (2) assessment of a representative spectrum of surgical conditions, including injuries. Data was collected regarding an individual's experience of injury including road traffic injuries, falls, penetrating trauma and burns. Data included anatomic location, timing of injury and whether or not healthcare was sought, and if not, the reason for barrier to care. Descriptive statistics was used to analyse the data.

Results: Of the 2695 individuals from 1,350 households interviewed, 141 individuals reported injuries secondary to falls (5.2%, 95% CI 4.4% to 6.1%), with a mean age of 30.7 (SD 20.0); 58% were male. Falls represented 44.3% of total injuries (n=320) reported (95% CI 38.8% to 50.0%). The most common locations of injuries due to falls were in the extremity, 73.2% (SD 3.7%, 95% CI 65.7% to 80.8%, Table 1); the upper extremities were the most common site in the extremities that were involved (52.1%). Twelve individuals had an unmet surgical need (8.5%, 95% CI 4.5% to 14.4%). Reasons for barrier to care included: no money for healthcare (n=3), facility/personnel not available (n=7) and fear/no trust (n=2). Of the 80 recent deaths, 7 were due to injuries from falls (8.8%, 95% CI 3.6% to 17.2%), with a mean age of 46 years (SD 22.8). Surgical care was not delivered to those who died; reasons included no time (n=4), facility/personnel not available (n=1), fear/no trust (n=1) and no need (n=1).

Conclusion: This study provides population-based data on injury prevalence in Nepal, identifying injuries due to falls as a major public health problem. While health education to reduce the risk of falls remains essential, these data highlight persistent barriers to access to care for the injured and the need to improve trauma care systems in Nepal.
Table 1. Anatomic location of fall injuries

<table>
<thead>
<tr>
<th>Anatomic location</th>
<th>Injuries due to falls, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremities</td>
<td>104 (73.2)</td>
</tr>
<tr>
<td>Face, head and neck</td>
<td>31 (21.8)</td>
</tr>
<tr>
<td>Back</td>
<td>4 (2.8)</td>
</tr>
<tr>
<td>Chest</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Abdomen</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Groin</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>
14.16 - ASC20150467

Knowledge of Colorectal Carcinoma screening Among General Population in Western Region of Nepal
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Scientific Area: Comparative Effectiveness/Patient-Centered Outcomes
Clinical Area: Oncology

Introduction: Colorectal Carcinoma has emerged as third most common malignant tumor, second leading cause of death among cancer patients in the world and has been increasing in developing countries. In this study our objective was to determine the knowledge and attitude of CRC and to understand the factors that contribute to low screening rates in our region.

Methods: We interviewed 800 participants aged 40 years and above with 200 participants each from Kaski, Baglung, Parbat and Syangja district which are in Western region of Nepal. We used questionnaires to determine the socio-demographic characteristic, knowledge about CRC, screening, as well as screening test.

Results: The majority participants were illiterate with monthly income less than Nrs 10,000 ($100). Regarding lifestyle practices most of them were smokers (68%) and consumed alcohol (48%). Among the participants, 20% of them said there exists no cancer as Colorectal Carcinoma. The rest of them who knew CRC exists the knowledge about it and is screening were very poor. Only 25% and 10% of them knew about FOBT and Colonoscopy but none of them had idea about barium enema and flexible sigmoidoscopy. Majority of them (55%) agreed to do screening tests even if they did not have any symptom and 40% of the participants said the disease had good prognosis if diagnosed early.

Conclusion: The result of the current study provide information about the need for education campaigns about CRC and its screening to reduce the incidence of deaths due to CRC.
14.17 - ASC20150882

Impacting the Global Trauma Burden -- Training First Responders in Mozambique
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Scientific Area: Global Surgery
Clinical Area: Trauma/Critical Care

Introduction: Over half of prehospital deaths in low-income countries are the result of airway compromise, respiratory failure or uncontrolled hemorrhage; all three of these conditions can be addressed using basic first aid measures. For both hospital personnel and laypersons, a basic trauma resuscitation training in modified ABC techniques can be easily learned and applied to increase the number of first responders in Mozambique, a resource-challenged country. This approach supports WHO guidelines to reduce the impact of an injury once it occurs and optimize its outcome.

Methods: In March 2014, a trauma training session was administered to 100 people in Mozambique: half were hospital personnel from 7 district medical centers and the other half were selected laypersons. Five of the hospitals advertised surgical capability; two other medical centers were chosen based on long transport times to main hospitals and need for patient stabilization. This training session included a pre-test, intervention, and post-test to evaluate and demonstrate first response skills of airway management, hemorrhage control, and cervical spine precautions using resources available in hospital and street settings. Paired t-tests and linear regression curves were used to analyze the data.

Results: Laypersons answered 26.9% of the pre-test questions correctly and showed 86.9% improvement in their scores after the intervention; hospital personnel initially answered 41.7% correctly and improved their scores by 44%. All participants were able to open an airway, externally control hemorrhage, and transport a patient with appropriate precautions. In addition, hospital personnel were able to verbalize intravenous fluid resuscitation and oxygen application during assessment.

Conclusion: The trauma training session served as new information that improved knowledge and skills for both groups, as well as increased the number of first responders in Mozambique. This knowledge can minimize secondary and tertiary injuries by providing effective prehospital care in developing nations with limited trauma resources. Thus, this study supports WHO recommendations to utilize the strengths of a developing nation - population - as the first step in establishing an organized trauma triage system.
14.18 - ASC20151105

Geriatric Emergency General Surgery – Survival and Outcomes in a Low-Middle Income Country
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Scientific Area: Global Surgery
Clinical Area: Trauma/Critical Care

Introduction: Geriatric surgical outcomes remain grossly understudied in low-middle income healthcare settings. The purpose of this study was to compare epidemiology and outcomes between old and young adults presenting to a tertiary care facility in South Asia for emergency general surgical (EGS) conditions.

Methods: Discharge data from a university hospital were obtained for all adult patients (≥16 years) presenting between March 2009 and April 2014 with ICD-9-CM diagnosis codes consistent with an EGS condition, as described by the American Association for the Surgery of Trauma (AAST). The patient population was dichotomized into old (>65 years) and young (≤65 years) adults. Multivariate analyses, accounting for age, gender, year of admission, type of admission, admitting specialty, length of stay (LOS), major complications and Charlson Comorbidity Index, were used to compare the two populations. Outcomes of interest included all-cause mortality, major complications and LOS.

Results: A total of 13,893 patients were included. Patients >65 years constituted 15.3% (n=2,123) of the patient population. Old adults were more likely to be male (OR[95%CI]: 1.14 [1.02-1.27]) and present through the ED (OR[95%CI]: 1.22[1.09-1.38]). They more commonly presented with gastrointestinal bleeding (OR[95%CI]: 2.63[1.99-3.46]) and for resuscitation (OR[95%CI]: 2.17 [1.67-2.80]). After multivariate adjustment, age >65 years independently accounted for a 60% increase in mortality (OR[95%CI]: 1.60 [1.18-2.16]). Elderly patients also had a higher likelihood of developing major complications (OR[95%CI]: 2.09[1.67-2.61]). There were no significant differences in lengths of hospital stay between elderly and young-adult patients (4.3 vs. 4.5 days, respectively).

Conclusion: Older adults seem to suffer from a different set of EGS conditions compared to their younger counterparts. The results of this study will assist in formulating specialized management guidelines and help prioritize care for geriatric patients with EGS conditions in low-middle income healthcare settings.

Table: Describes the five EGS conditions that old adults (X) have a higher likelihood of presenting with compared to young adults (Y)

(Shaded boxes represent results that are statistically significant, p-value < 0.05)

<table>
<thead>
<tr>
<th>#</th>
<th>Diagnosis</th>
<th>X/Y (%)</th>
<th>Odds Likelihood [OR [95% CI]]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gastrointestinal Bleeding</td>
<td>76/164  (31.7)</td>
<td>2.63 [1.99-3.46]</td>
</tr>
<tr>
<td>2</td>
<td>Resuscitation</td>
<td>83/217  (27.7)</td>
<td>2.17 [1.67-2.80]</td>
</tr>
<tr>
<td>3</td>
<td>Peptic Ulcer Disease</td>
<td>34/91   (27.2)</td>
<td>2.09 [1.40-3.10]</td>
</tr>
<tr>
<td>4</td>
<td>Hernias</td>
<td>469/1735 (21.3)</td>
<td>1.64 [1.46-1.84]</td>
</tr>
<tr>
<td>5</td>
<td>Vascular Disease</td>
<td>47/161  (22.6)</td>
<td>1.63 [1.17-2.27]</td>
</tr>
</tbody>
</table>

[OR, Odds Ratio, CI: Confidence Interval]
**14.19 - ASC20150969**

An Estimation of Cost Arising From Motorcycles Injuries in Kigali, Rwanda

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Scientific Area: Global Surgery
Clinical Area: Trauma/Critical Care

**Introduction:** Motorcycles has become a popular mean of transport in Kigali, Rwanda and their injuries are associated with a high number of admissions in the main referral hospital of Kigali. These accidents are associated with a high financial burden to the country. This study aimed at evaluates the total cost arising from motorcycles injuries of patients admitted at University Teaching Hospital of Kigali.

**Methods:** Retrospective cross-sectional cost study of motorcycles injured patients admitted in University Teaching Hospital of Kigali from January-December, 2011. Data were collected from patient medical, police, insurance and financial records as well as patient interviews. Cost analysis was based upon the standard road accident cost conceptual framework.

**Results:** A total of 1232 road traffic injuries were reported during the study period and Motorcycle injuries accounted for 73.05% (900 cases) of all injuries. Youths were more involved in motorcycle accident (53.2%) than other age group (16-30 years). The majority of Motorcycles victims were motorcyclists, (30.86%) and Motorcycle-vehicle (41.61%) was the first cause of motorcycle injuries then motorcycle-pedestrian (30.86%). Head injuries and fractures were the predominant diagnoses (82.15%). The mean hospital stay was 15.43 days, permanent disability was confirmed in 11.5% (n=104), and mortality rate was 10.4% (n=94). The total economic cost of motorcycle injuries was US$ 4,141,300. This is made up of about 28.28% accident-related costs and 71.72% casualty-related costs. The accident-related costs totaling US$892,775 was made up of property damaged costs of 21.56% and administration costs of 6.72%. Whilst the casualty-related cost of US$886,665.50 was made up of labor output costs estimated at US$ 1,631550 (39.4%) was the highest cost, followed by medical cost estimated atUS$901,150 (21.76%), out-of-pocket expenditure (5.9%), intangible costs (4.35%) and the lowest cost was funeral costs totaling US$24,007 (0.58%). The average cost per patient was estimated at US$4,601. There was significant association between category of injured patients and total cost/patient (p>0.05).

**Conclusion:** Motorcycle injuries create a substantial disability and cost burden in Kigali, Rwanda. Prevention and early treatment should be promoted to decrease the morbidity and financial burden.
Improving Trauma and Emergency Care in China: Results from an International Training Collaborative
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Scientific Area: Global Surgery
Clinical Area: Trauma/Critical Care

Introduction: The practice of emergency medicine in China officially began only 28 years ago. However, due to a lack of standardized formal training for emergency medical practitioners, the practice of trauma and emergency care in China is still in early development. Pre-hospital providers in China are typically physicians and nurses who undergo fragmented training at sites that hold variable certification requirements. International speakers are often invited to participate in the instruction of medical professionals. The purpose of this study is to evaluate the impact of an English-based trauma and emergency medicine training module on participants’ confidence in knowledge and skills.

Methods: An English-based training module was established in conjunction with several international institutions and the Chengdu 120 Center, Chengdu, China. 4 days of structured training in English with consecutive Chinese translation consisted of didactic presentations and practical skills stations targeting nurses and physicians. Participants completed surveys assessing pre and post confidence in knowledge and skills using a semantic differential scale.

Results: A total of 101 surveys were collected from 63 doctors and 38 nurses from Chengdu. 48% of participants were male. 71% of all participants were between the ages of 20 and 39. Education ranged from high school to master’s level of training. 66% of participants reported having received formal training in trauma within the last 2 years and 56% reported having received formal training in disaster management. Of the 101 surveys, 86 (55 doctors and 31 nurses) were complete for statistical analysis. Student’s t test revealed a statistically significant increase in perceived confidence level in all of the 14 topics of instruction (p<.0001). An increase in confidence was reported in both physicians and nurses, regardless of the participant’s years of experience in his or her respective occupation. Improvement was also significant irrespective of the participant’s previous training experience within the last 2 years.

Conclusion: Trauma and emergency medical services have limited capacity in most areas of China. Foreign instructors are often invited to participate in health provider instruction. Potential barriers to the success of such a program include language and teaching style. A structured educational program based in English with consecutive Chinese translation positively impacted confidence levels of first responders in Chengdu, China. Participants felt more competent in all areas of topics and skills of instruction, which may ultimately improve provider skills in pre-hospital management of trauma and emergencies. These responses were seen in physicians and nurses across all experience levels. The collaboration between local Chinese and international medical professionals may help improve current Chinese emergency medical practices.