

Book of ABSTRACTS OF PUBLICATIONS

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University for Development Studies - School of Medicine

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EQUITABLE ACCESS TO QUALITY TRAUMA SYSTEMS IN LOW-INCOME AND MIDDLE-INCOME COUNTRIES: ASSESSING GAPS AND DEVELOPING PRIORITIES IN GHANA, RWANDA AND SOUTH AFRICA

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Injuries in low-income and middle-income countries are prevalent and their number is expected to increase. Death and disability after injury can be reduced if people reach healthcare facilities in a timely manner. Knowledge of barriers to access to quality injury care is necessary to intervene to improve outcomes. We combined a four-delay framework with WHO Building Blocks and Institution of Medicine Quality Outcomes Frameworks to describe barriers to trauma care in three countries in sub-Saharan Africa: Ghana, South Africa and Rwanda. We used a parallel convergent mixedmethods research design, integrating the results to enable a holistic analysis of the barriers to access to quality injury care. Data were collected using surveys of patient experiences of injury care, interviews and focus group discussions with patients and community leaders, and a survey of policymakers and healthcare leaders on the governance context for injury care. We identified 121 barriers across all three countries. Of these, 31 (25.6%) were shared across countries. More than half (18/31, 58%) were predominantly related to delay 3 ('Delays to receiving quality care'). The majority of the barriers were captured using just one of the multiple methods, emphasising the need to use multiple methods to identify all barriers. Given there are many barriers to access to quality care for people who have been injured in

Rwanda, Ghana and South Africa, but few of these are shared across countries, solutions to overcome these barriers may also be contextually dependent. This suggests the need for rigorous assessments of contexts using multiple data collection methods before developing interventions to improve access to quality care.

ECONOMIC EVALUATION OF EXPANDING INGUINAL HERNIA REPAIR AMONG ADULT MALES IN GHANA

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An unmet need for inguinal hernia repair is significant in Ghana, where the number of specialist general surgeons is extremely limited. While surgical task sharing with medical doctors without formal specialist training in surgery has been adopted for inguinal hernia repair in Ghana, no prior research has been conducted on the long-term costs and health outcomes associated with expanding operations to repair all inguinal hernias among

adult males in Ghana. The study aimed to estimate cost-effectiveness of elective open mesh repair performed by medical doctors and surgeons for adult males with primary inguinal hernia compared to no treatment in Ghana and to project costs and health gains associated with expanding operation services through task sharing between medical doctors and surgeons. The study analysis adopted a healthcare system perspective. A Markov model was constructed to assess 10-year differences in costs and outcomes between operations conducted by medical doctors or surgeons and no treatment. A 10-year budget impact analysis on service expansion for groin hernia repair through increasing task sharing between the providers was conducted. Incremental cost-effectiveness ratios for medical doctors and surgeons were USD 120 and USD 129 respectively per disability-adjusted life year (DALY) averted compared to no treatment, which is below the estimated threshold value for cost-effectiveness in Ghana of USD 371-491. Repairing all inguinal hernias (1.4 million) through task-sharing between the providers in the same timeframe is estimated to cost USD 194 million. Total health gains of 1.5 million DALYs averted are expected. Inguinal hernia repair is cost-effective regardless of the type of surgical provider. Scaling up inguinal hernia repair is worthwhile, with the potential to substantially reduce the disease burden in the country.

GLOBAL GUIDELINES FOR EMERGENCY GENERAL SURGERY: SYSTEMATIC REVIEW AND DELPHI PRIORITIZATION PROCESS

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heading Collaborators.

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Background: Existing emergency general surgery (EGS) guidelines rarely include evidence from low- and middle-income countries (LMICs) and may lack relevance to low-resource settings. This study aimed to develop global guidelines for EGS that are applicable across all hospitals and health systems. Methods: A systematic review and thematic analysis were performed to identify recommendations relating to undifferentiated EGS. Those deemed relevant across all resource settings by an international guideline development panel were included in a four-round Delphi prioritization process and are reported according to International Standards for Clinical Practice Guidelines. The final recommendations were included as essential (baseline measures that should be implemented as a priority) or desirable (some hospitals may lack relevant resources at present but should plan for future implementation). Results: After a thematic analysis of 38 guidelines with 1396 unique recommendations, 68 recommendations were included in round 1 voting (410 respondents (219 from LMICs)). The final guidelines included eight essential, one desirable, and three critically unwell patientspecific recommendations. Preoperative recommendations included guidance on timely transfers, CT scan pathways, handovers, and discussion with senior surgeons. Perioperative recommendations included surgical checklists and recovery room monitoring. Postoperative recommendations included early-warning scores, discharge plans, and morbidity meetings. Recommendations for critically unwell patients included prioritization for theatre, senior team supervision, and high-level postoperative care. Conclusion: This pragmatic and representative process created evidence-based global guidelines for EGS that are suitable for resource limited environments around the world.

A QUALITATIVE EXPLORATION OF NUTRITION SCREENING, ASSESSMENT AND ORAL SUPPORT USED IN PATIENTS UNDERGOING CANCER SURGERY IN LOW- AND MIDDLE-INCOME COUNTRIES

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Preoperative undernutrition is a prognostic indicator for postoperative mortality and morbidity. Evidence suggests that treating undernutrition can improve surgical outcomes. This study explored the provision of nutritional screening, assessment and support on surgical cancer wards in low- and middle-income countries (LMICs). This was a qualitative study and participants took part in one focus group or individual interview. Data were analysed thematically. There were 34 participants from Ghana, India, the Philippines and Zambia: 24 healthcare professionals (HCPs) and ten patients. Results showed that knowledge levels and enthusiasm were high in HCPs. Barriers to adequate nutritional support were a lack of provision of ward and kitchen equipment, food and sustainable nutritional supplements. There was variation across countries towards nutritional screening and assessment, which was driven by resources. Many hospitals where resources were scarce focused on the care of individual patients in favour of an integrated systems approach to identify and manage undernutrition. In conclusion, there is

scope to improve the efficiency of nutritional management of surgical cancer patients in LMICs through the integration of nutrition assessment and support into routine hospital policies and procedures, moving from case management undertaken by interested personnel to a system-based approach including the whole multidisciplinary team.

SARS-COV-2 INFECTION AND VENOUS THROMBOEMBOLISM AFTER SURGERY: AN INTERNATIONAL PROSPECTIVE COHORT STUDY

COVIDSurg Collaborative* and GlobalSurg Collaborative* NIHR Global Health Research Unit on Global Surgery, Birmingham, UK

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SARS-CoV-2 has been associated with an increased rate of venous thromboembolism in critically ill patients. Since surgical patients are already at higher risk of venous thromboembolism than general populations, this study aimed to determine if patients with peri-operative or prior SARS-CoV-2 were at further increased risk of venous thromboembolism. We conducted a planned sub-study and analysis from an international, multicentre, prospective cohort study of elective and emergency patients undergoing surgery during October 2020. Patients from all surgical specialities were included. The primary outcome measure was venous thromboembolism (pulmonary embolism or deep vein thrombosis) within 30 days of surgery. The SARS-CoV-2 diagnosis was defined as peri-operative (7 days before to 30 days after surgery); recent (1–6 weeks before surgery); previous (≥7 weeks before surgery); or none. Information on prophylaxis regimens or preoperative anticoagulation for baseline comorbidities was not available. Postoperative venous thromboembolism rate was 0.5% (666/123,591) in patients without SARS-CoV-2; 2.2% (50/2317) in patients with peri-operative SARS-CoV-2; 1.6% (15/953) in patients with recent SARS-CoV-2; and 1.0% (11/1148) in patients with previous SARS-CoV-2. After adjustment for

confounding factors, patients with peri-operative (adjusted odds ratio 1.5 (95%CI 1.1–2.0)) and recent SARS-CoV-2 (1.9 (95%CI 1.2–3.3)) remained at higher risk of venous thromboembolism, with a borderline finding in previous SARS-CoV-2 (1.7 (95%CI 0.9–3.0)). Venous thromboembolism was independently associated with 30-day mortality (5.4 (95%CI 4.3–6.7)). In patients with SARS-CoV-2, mortality without venous thromboembolism was 7.4% (319/4342) and with venous thromboembolism was 40.8% (31/76). Patients undergoing surgery with peri-operative or recent SARS-CoV-2 appear to be at increased risk of postoperative venous thromboembolism compared with patients with no history of SARS-CoV-2 infection. Optimal venous thromboembolism prophylaxis and treatment are unknown in this cohort of patients, and these data should be interpreted accordingly.

Keywords: COVID-19; deep vein thrombosis; pulmonary embolism; SARS-CoV-2; venous thromboembolism

EARLY OUTCOMES AND COMPLICATIONS FOLLOWING CARDIAC SURGERY IN PATIENTS TESTING POSITIVE FOR CORONAVIRUS DISEASE 2019: AN INTERNATIONAL COHORT STUDY

The Cardiothoracic Interdisciplinary Research Network and COVIDSurg
Collaborative

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PREOPERATIVE NASOPHARYNGEAL SWAB TESTING AND POSTOPERATIVE PULMONARY COMPLICATIONS IN PATIENTS UNDERGOING ELECTIVE SURGERY DURING THE SARS-COV-2 PANDEMIC

COVIDSurg Collaborative

British Journal of Surgery, 108(1), 88-96, 2021. doi: 10.1093/bjs/znaa051

Background: Surgical services are preparing to scale up in areas affected by COVID-19. This study evaluated the association between preoperative SARS-CoV-2 testing and postoperative pulmonary complications in patients undergoing elective cancer surgery.

Methods: This international cohort study included adult patients undergoing elective surgery for cancer in areas affected by SARS-CoV-2 up to 19 April 2020. Patients suspected of SARS-CoV-2 infection before the operation were excluded. The primary outcome measure was postoperative pulmonary complications on 30 days after surgery. Preoperative testing strategies were adjusted for confounding using mixed-effects models.

Results: Of 8784 patients (432 hospitals, 53 countries), 2303 patients (26.2 per cent) underwent preoperative testing: 1458 (16.6 per cent) had a swab test, 521 (5.9 per cent) CT only, and 324 (3.7 per cent) swab and CT. Pulmonary complications occurred in 3.9 per cent, whereas SARS-CoV-2 infection was confirmed in 2.6 per cent. After risk adjustment, having at least one negative preoperative nasopharyngeal swab test (adjusted odds ratio 0.68, 95 per cent confidence interval 0.68 to 0.98; P ¼ 0.040) was associated with a lower rate of pulmonary complications. Swab testing was beneficial before major surgery and in areas with a high 14-day SARS-CoV-2 case notification rate, but not before minor surgery or in low-risk areas. To prevent one pulmonary complication, the number needed to swab test before major or minor surgery was 18 and 48 respectively in high-risk areas and 73 and 387 in low-risk areas.

Conclusion: Preoperative nasopharyngeal swab testing was beneficial before major surgery and in high SARS-CoV-2 risk areas. There was no proven benefit of swab testing before minor surgery in low-risk areas.

EFFECT OF COVID-19 PANDEMIC LOCKDOWNS ON PLANNED CANCER SURGERY FOR 15 TUMOUR TYPES IN 61 COUNTRIES: AN INTERNATIONAL, PROSPECTIVE, COHORT STUDY

COVIDSurg Collaborative

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Lancet Oncology, 22(11), 1507-1517, 2021. doi: 10.1016/S1470-2045(21)00493-9

Background: Surgery is the main modality of the cure for solid cancers and was prioritised to continue during COVID-19 outbreaks. This study aimed to identify immediate areas for system strengthening by comparing the delivery of elective cancer surgery during the COVID-19 pandemic in periods of lockdown versus light restrictions.

Method: this international, prospective cohort study enrolled 20 006 adults (≥18 years) patients from 466 hospitals in 61 countries with fifteen (15) cancer types who had a decision for curative surgery during the COVID-19 pandemic and were followed up until the point of surgery or cessation of follow-up (Aug 31, 2020). Average national Oxford COVID-19 Stringency Index scores were calculated to define the government response to COVID-19 for each patient for the period they awaited surgery, and classified into light restrictions (index 60). The primary outcome was the non-operation rate (defined as the proportion of patients who did not undergo planned surgery). Cox proportional-hazards regression models were used to explore the associations between lockdowns and non-operation. Intervals from diagnosis to surgery were compared across COVID-19 government response index groups. This study was registered at ClinicalTrials.gov, NCT04384926.

Findings: Eligible patients awaiting surgery, 2003 (10 0%) of 20 006 did not receive surgery after a median follow-up of 23 weeks (IQR 16–30), all of whom had a COVID-19-related reason given for non-operation. Light restrictions were associated with a 0 6% non-operation rate (26 of 4521), moderate lockdowns with a 5 5% rate (201 of 3646; adjusted hazard ratio [HR] 0 81, 95% CI 0·77–0 84; p<0 0001), and full lockdowns with a 15 0% rate (1775 of 11 827; HR 0·51, 0·50–0·53; p<0 0001). In sensitivity analyses, including adjustment for SARS-CoV-2 case notification rates, moderate lockdowns (HR 0·84, 95% CI 0·80–0·88; p<0 001), and full lockdowns (0·57, 0·54–0·60; p<0 001), remained independently associated with non-operation. Surgery beyond 12 weeks from diagnosis in patients without neoadjuvant therapy increased during lockdowns (374 [9·1%] of 4521 in light restrictions, 317 [10·4%] of 3646 in moderate lockdowns, 2001 [23·8%] of 11·827 in full lockdowns). However, there were no differences in resectability rates observed with longer delays.

Interpretation: Cancer surgery systems worldwide were fragile to lockdowns, with one in seven patients who were in regions with full lockdowns not undergoing planned surgery and experiencing longer preoperative delays. Although short-term oncological outcomes were not compromised in those selected for surgery, delays and non-operation might lead to long-term reductions in survival. During current and future periods of societal restriction, the resilience of elective surgery systems requires strengthening, which might include protected elective surgical pathways and long-term investment in surge capacity for acute care during public health emergencies to protect elective staff and services.

MACHINE LEARNING RISK PREDICTION OF MORTALITY FOR PATIENTS UNDERGOING SURGERY WITH PERIOPERATIVE SARS-COV-2: THE COVIDSURG MORTALITY SCORE

COVIDSurg Collaborative

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REDUCING SURGICAL SITE INFECTIONS IN LOW-INCOME AND MIDDLE-INCOME COUNTRIES (FALCON): A PRAGMATIC, MULTICENTRE, STRATIFIED, RANDOMISED CONTROLLED TRIAL

NIHR Global Research Health Unit on Global Surgery

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Background: Surgical site infection (SSI) is the most common postoperative complication worldwide. WHO guidelines to prevent SSI recommend alcoholic chlorhexidine skin preparation and fascial closure using triclosan-coated sutures but called for an assessment of both interventions in low-

resource settings. This study aimed to test both interventions in low-income and middle-income countries.

Methods: FALCON was a 2×2 factorial, randomised controlled trial stratified by whether surgery was clean-contaminated, or contaminated or dirty, including patients undergoing abdominal surgery with a skin incision of 5 cm or greater. This trial was undertaken in fifty-four (54) hospitals in seven (7) countries (Benin, Ghana, India, Mexico, Nigeria, Rwanda, and South Africa). Patients were computer randomised 1:1:1:1 to (1) 2% alcoholic chlorhexidine and non-coated suture, (2) 2% alcoholic chlorhexidine and triclosan-coated suture, (3) 10% aqueous povidone-iodine and non-coated suture, or (4) 10% aqueous povidone-iodine and triclosan-coated suture. Patients and outcome assessors were masked to intervention allocation. The primary outcome was SSI, reported by trained outcome assessors and presented using adjusted relative risks and 95% CIs. Analysis was by intention to treat. This trial is registered with ClinicalTrials.gov, NCT03700749.

Findings Between Dec 10, 2018, and Sept 7, 2020, 5788 patients (3091 in cleancontaminated stratum, 2697 in contaminated or dirty stratum) were randomised (1446 to alcoholic chlorhexidine and non-coated suture, 1446 to alcoholic chlorhexidine and triclosan-coated suture, 1447 to aqueous povidone-iodine and non-coated suture, and 1449 to aqueous povidoneiodine and triclosan-coated suture). Fourteen percent (14 0%) (810/5788) of patients were children, and 66 9% (3873/5788) had emergency surgery. The overall SSI rate was 22 0% (1163/5284; clean-contaminated stratum 15 5% [454/2923], contaminated or dirty stratum 30 0% [709/2361]). For both strata, there was no evidence of a difference in the risk of SSI with alcoholic chlorhexidine versus povidone-iodine (clean-contaminated stratum 15 3% [223/1455] vs 15.7% [231/1468], relative risk 0.97 [95% CI 0.82-1.14]; contaminated or dirty stratum 28 3% [338/1194] vs 31 8% [371/1167], relative risk 0 91 [95% CI 0 81-1 02]), or with triclosan-coated sutures versus non-coated sutures (clean-contaminated stratum 14.7% [215/1459] vs 16.3% [239/1464], relative risk 0.90 [95% CI 0.77-1.06]; contaminated or dirty stratum 29 4% [347/1181] vs 30 7% [362/1180], relative risk 0 98 [95% CI

0.87–1.10]). With both strata combined, there were no differences using alcoholic chlorhexidine or triclosan-coated sutures.

Interpretation: This trial did not show benefit from 2% alcoholic chlorhexidine skin preparation compared with povidone-iodine or with triclosan-coated sutures compared with non-coated sutures, in preventing SSI in clean-contaminated or contaminated or dirty surgical wounds. Both interventions are more expensive than alternatives, and these findings do not support recommendations for routine use.

PAEDIATRIC SURGICAL OUTCOMES IN SUB-SAHARAN AFRICA: A MULTICENTRE, INTERNATIONAL, PROSPECTIVE COHORT STUDY

PaedSurg Africa Research Collaboration

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Introduction: As childhood mortality from infectious diseases falls across sub-Saharan Africa (SSA), the burden of disease attributed to surgical conditions is increasing. However, limited data exist on paediatric surgical outcomes in SSA. We compared the outcomes of five common paediatric surgical conditions in SSA with published benchmark data from high-income countries (HICs).

Methods: A multicentre, international, prospective cohort study was undertaken in hospitals providing paediatric surgical care across SSA. Data were collected on consecutive children (birth to 16 years), presenting with gastroschisis, anorectal malformation, intussusception, appendicitis or inguinal hernia, over a minimum of 1 month, between October 2016 and April 2017. Participating hospitals completed a survey on their resources available for paediatric surgery. The primary outcome was all-cause inhospital mortality. Mortality in SSA was compared with published benchmark mortality in HICs using $\chi 2$ analysis. Generalised linear mixed models were used to identify patient-level and hospital-level factors affecting mortality. A p<0.05 was deemed significant.

Results: One thousand, four hundred and seven (1407) children from 51 hospitals in 19 countries across SSA were studied: 111 with gastroschisis, 188 anorectal malformations, 225 intussusceptions, 250 appendicitis and 633 inguinal hernia. Mortality was significantly higher in SSA compared with HICs for all conditions: gastroschisis (75.5% vs 2.0%), anorectal malformation (11.2% vs 2.9%), intussusception (9.4% vs 0.2%), appendicitis (0.4% vs 0.0%) and inguinal hernia (0.2% vs 0.0%), respectively. Mortality was 41.9% (112/267) among neonates, 5.0% (20/403) in infants and 1.0% (7/720) in children. Paediatric surgical condition, higher American Society of Anesthesiologists score at primary intervention, and needing/receiving a blood transfusion were significantly associated with multivariable analysis mortality.

Conclusion: Mortality from common paediatric surgical conditions is unacceptably high in SSA compared with HICs, particularly for neonates. Interventions to reduce mortality should focus on improving resuscitation and timely transfer at the district level, and preoperative resuscitation and perioperative care at paediatric surgical centres.

MORTALITY FROM GASTROINTESTINAL CONGENITAL ANOMALIES AT 264 HOSPITALS IN 74 LOW-INCOME, MIDDLE-INCOME, AND HIGH-INCOME COUNTRIES: A MULTICENTRE, INTERNATIONAL, PROSPECTIVE COHORT STUDY

Global PaedSurg Research Collaboration

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Background: congenital anomalies are the fifth leading cause of mortality in children younger than five years globally. Many gastrointestinal congenital

anomalies are fatal without timely access to neonatal surgical care, but few studies have been done on these conditions in low-income and middle-income countries (LMICs). We compared outcomes of the seven most common gastrointestinal congenital anomalies in low-income, middle-income, and high-income countries globally and identified factors associated with mortality.

Methods: We did a multicentre, international prospective cohort study of patients younger than 16 years, presenting to the hospital for the first time with oesophageal atresia, congenital diaphragmatic hernia, intestinal atresia, gastroschisis, exomphalos, anorectal malformation, and Hirschsprung's disease. Recruitment was of consecutive patients for a minimum of 1 month between October 2018, and April 2019. We collected data on patient demographics, clinical status, interventions, and outcomes using the REDCap platform. Patients were followed up for 30 days after primary intervention, or 30 days after admission if they did not receive an intervention. The primary outcome was all-cause, in-hospital mortality for all conditions combined and each condition individually, stratified by country income status. We did a complete case analysis.

Findings: We included 3849 patients with 3975 study conditions (560 with oesophageal atresia, 448 with congenital diaphragmatic hernia, 681 with intestinal atresia, 453 with gastroschisis, 325 with exomphalos, 991 with anorectal malformation, and 517 with Hirschsprung's disease) from 264 hospitals (89 in high-income countries, 166 in middle-income countries, and nine in low-income countries) in 74 countries. Of the 3849 patients, 2231 (58 0%) were male. At birth, the median gestational age was 38 weeks (IQR 36–39), and the median bodyweight at presentation was 2 8 kg (2 3–3 3). Mortality among all patients was 37 (39 8%) of 93 in low-income countries, 583 (20 4%) of 2860 in middle-income countries, and 50 (5 6%) of 896 in high-income countries (p<0.0001 between all country income groups). Gastroschisis had the most significant difference in mortality between country income strata (nine [90 0%] often in low-income countries, 97 [31 9%] of 304 in middle-income countries, and two [1 4%] of 139 in high-income countries; p≤0 0001 between all country income groups). Factors

significantly associated with higher mortality for all patients combined included country income status (low-income vs high-income countries, risk ratio 2.78 [95% CI 1.88–4.11], p<0.0001; middle-income vs high-income countries, 2.11 [1.59–2.79], p<0.0001) sepsis at presentation (1.20 [1.04–1.40], p=0.016), higher American Society of Anesthesiologists (ASA) score at primary intervention (ASA 4–5 vs ASA 1–2, 1.82 [1.40–2.35], p<0.0001; ASA 3 vs ASA 1–2, 1.58, [1.30–1.92], p<0.0001]), surgical safety checklist not used (1.39 [1.02–1.90], p=0.035), and ventilation or parenteral nutrition unavailable when needed (ventilation 1.96, [1.41–2.71], p=0.0001; parenteral nutrition 1.35, [1.05–1.74], p=0.018). Administration of parenteral nutrition (0.61, [0.47–0.79], p=0.0002) and use of a peripherally inserted central catheter (0.65 [0.50–0.86], p=0.0024) or percutaneous central line (0.69 [0.48–1.00], p=0.049) were associated with lower mortality.

Interpretation: Unacceptable differences in mortality exist for gastrointestinal congenital anomalies between low-income, middle-income, and high-income countries. Improving access to quality neonatal surgical care in LMICs will be vital to achieve Sustainable Development Goal 3.2 of ending preventable deaths in neonates and children younger than five years by 2030.

TIMING OF SURGERY FOLLOWING SARS-COV-2 INFECTION: AN INTERNATIONAL PROSPECTIVE COHORT STUDY

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Peri-operative SARS-CoV-2 infection increases postoperative mortality. This study aimed to determine the optimal duration of planned delay before surgery in patients who have had SARS-CoV-2 infection. This international, multicentre, prospective cohort study included patients undergoing elective or emergency surgery during October 2020. Surgical patients with pre-

operative SARS-CoV-2 infection were compared with those without previous SARS-CoV-2 infection. The primary outcome measure was 30-day postoperative mortality. Logistic regression models were used to calculate adjusted 30-day mortality rates stratified by time from diagnosis of SARS-CoV-2 infection to surgery. Among 140,231 patients (116 countries), 3127 patients (2.2%) had a pre-operative SARS-CoV-2 diagnosis. Adjusted 30-day mortality in patients without SARS-CoV-2 infection was 1.5% (95%CI 1.4-1.5). In patients with a pre-operative SARS-CoV-2 diagnosis, mortality was increased in patients having surgery within 0-2 weeks, 3-4 weeks and 5-6 weeks of the diagnosis (odds ratio (95%CI) 4.1 (3.3-4.8), 3.9 (2.6-5.1) and 3.6 (2.0-5.2), respectively. Surgery performed ≥ 7 weeks after SARS-CoV-2 diagnosis was associated with a similar mortality risk to baseline (odds ratio (95%CI) 1.5 (0.9-2.1)). After a \geq 7 week delay in undertaking surgery following SARS-CoV-2 infection, patients with ongoing symptoms had higher mortality than patients whose symptoms had resolved or who had been asymptomatic (6.0% (95%CI 3.2- 8.7) vs. 2.4% (95%CI 1.4-3.4) vs. 1.3% (95%CI 0.6-2.0), respectively). Surgery should be delayed for at least seven weeks following SARS-CoV-2 infection. Patients with ongoing symptoms ≥ 7 weeks from diagnosis may benefit from further delay.

SARS-COV-2 VACCINATION MODELLING FOR SAFE SURGERY TO SAVE LIVES: DATA FROM AN INTERNATIONAL PROSPECTIVE COHORT STUDY

COVIDSurg Collaborative, GlobalSurg Collaborative*

Members of the COVIDSurg Collaborative and GlobalSurg Collaborative are co-authors of this study and are listed under the heading Collaborators.

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Background: Preoperative SARS-CoV-2 vaccination could support safer elective surgery. Vaccine numbers are limited, so this study aimed to inform their prioritization by modelling. Methods: The primary outcome was the number needed to vaccinate (NNV) to prevent one COVID-19-related death in 1 year. NNVs were based on postoperative SARS-CoV-2 rates and mortality in an international cohort study (surgical patients) and community SARS-CoV-2 incidence and case fatality data (general population). NNV estimates were stratified by age (18-49, 50-69, 70 or more years) and type of surgery. Best- and worst-case scenarios were used to describe uncertainty. Results: NNVs were more favourable in surgical patients than in the general population. The most favourable NNVs were in patients aged 70 years or more needing cancer surgery (351; best case 196, worst case 816) or noncancer surgery (733; best case 407, worst case 1664). Both exceeded the NNV in the general population (1840; best case 1196, worst case 3066). NNVs for surgical patients remained favourable at a range of SARS-CoV-2 incidence rates in sensitivity analysis modelling. Globally, prioritizing preoperative vaccination of patients needing elective surgery ahead of the general population could prevent 58 687 (best case 115 007, worst case 20 177) COVID-19-related deaths in 1 year. Conclusion: As the global rollout of SARS-CoV-2 vaccination proceeds, patients needing elective surgery should be prioritized ahead of the general population

FEASIBILITY AND DIAGNOSTIC ACCURACY OF TELEPHONE ADMINISTRATION OF AN ADAPTED WOUND HEALING QUESTIONNAIRE FOR ASSESSMENT FOR SURGICAL SITE INFECTION FOLLOWING ABDOMINAL SURGERY IN LOW AND MIDDLE-INCOME COUNTRIES (TALON): PROTOCOL FOR A STUDY WITHIN A TRIAL (SWAT)

NIHR Global Health Research Unit on Global Surgery

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Background: Surgical site infection is the most common complication of abdominal surgery, with a global impact on patients and health systems. There are no tools to identify wound infection that are validated for use in the global setting. The overall aim of the study described in this protocol is to evaluate the feasibility and validity of a remote, digital pathway for wound assessment after hospital discharge for patients in low- and middle-income countries (LMICs). Methods: A multi-centre, international, mixed-methods study within a trial, conducted in two stages (TALON-1 and TALON-2). TALON-1 will adapt and translate a universal reporter outcome measurement tool (Bluebelle Wound Healing Questionnaire, WHQ) for use in global surgical research (SWAT store registration: 126) that can be delivered over the telephone. TALON-2 will evaluate a remote wound assessment pathway (including trial retention) and validate the diagnostic accuracy of this adapted WHQ through a prospective cohort study embedded within two global surgery trials. Embedded community engagement and involvement activities will be used to optimise delivery and

ensure culturally attuned conduct. TALON-1 and TALON-2 are designed and will be reported in accordance with best practice guidelines for adaptation and validation of outcome measures, and diagnostic test accuracy studies. Discussion: Methods to identify surgical site infection after surgery for patients after hospital discharge have the potential to improve patient safety, trial retention, and research efficiency. TALON represents a large, pragmatic, international study co-designed and delivered with LMIC researchers and patients to address an important research gap in global surgery trial methodology.

Keywords: Digital follow-up, Surgical site infection, Telephone follow-up, Outcome assessment, Trial retention, Trial methodology, Patient-reported outcome measure, Abdominal surgery, Global surgery, Surgery

COMMUNITY ENGAGEMENT AND INVOLVEMENT IN GHANA: CONVERSATIONS WITH COMMUNITY STAKEHOLDERS TO INFORM SURGICAL RESEARCH

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Background: Involving patients and communities with health research in low- and middle-income countries (LMICs) contributes to increasing the likelihood that research is relevant in local context and caters to the needs of the population, including vulnerable and marginalised groups. When done right, it can also support empowerment of wider communities in taking ownership of their own health, lead to increased access and uptake of health services and generally improve the wellbeing of individuals. However, the

evidence base on how to undertake successful community engagement and involvement (CEI) activities in LMICs is sparse. This paper aims to add to the available literature. It describes how the Global Health Research Unit on Global Surgery's (GSU) team in Ghana worked collaboratively with the Unit's team in the UK and a UK-based Public Advisory Group to involve community stakeholders in rural Ghana with surgical research. The aim was to explore ways to reach out to patients and community leaders in rural Ghana to have conversations informing the relevance, acceptability, and feasibility of a clinical trial called TIGER.

Methods: As this kind of larger scale involvement of community stakeholders with research was a novel way of working for the team in Ghana, a reflective approach was taken to outline step-by-step how the GSU team planned and undertook these involvement activities with 31 hernia patients, two Chiefs (community leaders), a community finance officer and a local politician in various locations in Ghana. The barriers that were experienced and the benefits of involving community stakeholders are highlighted with the aim to add to the evidence base of CEI in LMICs.

Results: GSU members from the UK and Ghana planned and organised successful involvement activities that focused on establishing the best way to talk to patients and other community stakeholders about their experiences of living with hernias and undergoing hernia repairs, and their perceptions of the impact of hernias on the wider community. The Ghanaian team suggested 1:1 conversations in easily accessible locations for rural patient contributors, creating a welcoming environment and addressing contributors in their local dialects. A UK-based Public Advisory Group helped in the initial stages of planning these conversations by highlighting potential barriers when approaching rural communities and advising on how to phrase questions around personal experiences. Conversations mainly focused on understanding the needs of hernia patients in rural Ghana to then incorporate these in the design of the TIGER trial to ensure its relevance, acceptability and feasibility. When talking to patient contributors, the GSU teams found that they were more likely to open up when they knew members of the team and the opportunity to speak to local leaders only arose

because the Ghanaian team members being well-respected amongst communities. The experiences of the patient and community contributors led to changes in the study protocol, such as including women in the patient cohort for the trial, and allowed the GSU teams to confirm the relevance and acceptability of this trial. These conversations also taught the team a lot about perceptions of health in rural communities, allowed the Ghanaian team to establish relationships with community leaders that can be utilised when future studies need input from the public, and has changed the minds of the Ghanaian research team about the importance of involving patients with research. Conclusion: This paper contributes to the evidence base on successful CEI activities in LMICs by providing an example of how CEI can be planned and organised and the benefits this provides. The teams' conversations with patient contributors in Ghana are an example of successful patient consultations. Even though there are certain limitations to the extent of these involvement activities, a solid foundation has been built for researchers and community stakeholders to establish relationships for ongoing involvement.

Keywords: Patient and public involvement, Community engagement and involvement, Low- and middle- income countries, Ghana, Surgery, Communities, patients, patient contributors

GLOBAL VARIATION IN POSTOPERATIVE MORTALITY AND COMPLICATIONS AFTER CANCER SURGERY: A MULTICENTRE, PROSPECTIVE COHORT STUDY IN 82 COUNTRIES

GlobalSurg Collaborative and National Institute for Health Research Global Health Research Unit on Global Surgery*

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Background: Eighty percent (80%) of individuals with cancer will require a surgical procedure, yet little comparative data exist on early outcomes in low-income and middle-income countries (LMICs). We compared postoperative outcomes in breast, colorectal, and gastric cancer surgery in hospitals worldwide, focusing on the effect of disease stage and complications on postoperative mortality.

Methods: this was a multicentre, international prospective cohort study of consecutive adult patients undergoing surgery for the primary breast, colorectal, or gastric cancer requiring a skin incision done under general or neuraxial anaesthesia. The primary outcome was death or major complication within 30 days of surgery. Multilevel logistic regression determined relationships within three-level nested models of patients within hospitals and countries. Hospital-level infrastructure effects were explored with three-way mediation analyses. This study was registered with ClinicalTrials.gov, NCT03471494.

Findings: between April 1, 2018, and Jan 31, 2019, we enrolled 15 958 patients from 428 hospitals in 82 countries (high income 9106 patients, 31 countries; Upper-Middle-Income 2721 patients, 23 countries; or lower-middle-income 4131 patients, 28 countries). Patients in LMICs presented with more advanced diseases compared with patients in high-income countries. 30-day mortality was higher for gastric cancer in low-income or lower-middle-income countries (adjusted odds ratio 3 72, 95% CI 1 70–8 16) and for colorectal cancer in low-income or Lower-Middle-Income countries (4 59, 2 39–8 80) and upper-middle-income countries (2 06, 1 11–3 83). No difference in 30-day mortality was seen in breast cancer. The proportion of patients who died after a major complication was greatest in low-income or lower-middle-income countries (6 15, 3 26–11 59) and upper-middle-income countries (3 89, 2 08–7 29). Postoperative death after complications was partly explained by patient factors (60%) and partly by hospital or country (40%). The absence of consistently available postoperative care facilities was

associated with seven to 10 more deaths per 100 major complications in LMICs. The cancer stage alone explained little of the early variation in mortality or postoperative complications.

Interpretation: Higher mortality levels after cancer surgery in LMICs were not fully explained by the later presentation of the disease. The capacity to rescue patients from surgical complications is a tangible opportunity for meaningful intervention. Policies focusing on strengthening perioperative care systems to detect and intervene in common complications might reduce early death after cancer surgery.

A RETROSPECTIVE REVIEW OF GASTROSCHISIS EPIDEMIOLOGY AND REFERRAL PATTERNS IN NORTHERN GHANA

Alhassan Abdul-Mumin, Cesia Cotache-Condor, Sheila A. Owusu, Andie Grimm, Haruna Mahama, Naomi Wright, Francis A. Abantanga, Emily R. Smith, **Stephen Tabiri** on behalf of the Global Initiative for Children Surgery

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Purpose: To describe the epidemiology and referral patterns of gastroschisis patients in northern Ghana.

Methods: A hospital-based retrospective review was undertaken at Tamale Teaching Hospital (TTH) Neonatal Intensive Care Unit (NICU) between 2014 and 2019. Data from gastroschisis patients were compared to patients with other surgical diagnoses. Descriptive and inferential statistics were performed with SAS. Referral flow maps were made with ArcGIS.

Results: From a total of 360 neonates admitted with surgical conditions, 12 (3%) were diagnosed with gastroschisis. Around 91% (n = 10) of gastroschisis patients were referred from other hospitals, travelling 4-hour, on average. Referral patterns showed gastroschisis patients were admitted from three regions, whereas patients with other surgical diagnoses were admitted from eight regions. Only 6% (12/201) of expected gastroschisis cases were

reported during the 6-year period in all regions. All gastroschisis deaths occurred within the first week of life.

Conclusions: Improving access to surgical care and reducing neonatal mortality related to gastroschisis in northern Ghana is critical. This study provides a baseline to inform future gastroschisis interventions at TTH. Priority areas may include special management of low birth weight newborns, better referral systems, empowerment of community health workers, and increasing access to timely, affordable, and safe neonatal transport.

Keywords: Gastroschisis epidemiology; Northern Ghana; Pediatric surgery; Referral system.

MORTALITY FROM ESOPHAGECTOMY FOR ESOPHAGEAL CANCER ACROSS LOW, MIDDLE, AND HIGH-INCOME COUNTRIES: AN INTERNATIONAL COHORT STUDY

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European Journal of Surgical Oncology, 47(6), 1481-1488, 2021. doi: 10.1016/j.ejso.2020.12.006.

Background: No evidence currently exists characterising global outcomes following major cancer surgery, including esophageal cancer. Therefore, this study aimed to characterise impact of high income countries (HIC) versus Low- and Middle-Income Countries (LMIC) on the outcomes following esophagectomy for esophageal cancer.

Method: This international multi-centre prospective study across 137 hospitals in 41 countries included patients who underwent an esophagectomy for esophageal cancer, with a 90-day follow-up. According to the World Bank Data classification, the main explanatory variable was country income. The primary outcome was 90-day postoperative mortality,

and secondary outcomes were composite leaks (anastomotic leak or conduit necrosis) and major complications (Clavien-Dindo Grade III - V). Multivariable generalized estimating equation models produced adjusted odds ratios (ORs) and 95% confidence intervals ($CI_{95\%}$).

Results: Between April 2018 to December 2018, 2247 patients were included. Patients from HIC were more significantly older, with higher ASA grade, and more advanced tumors. Patients from LMIC had almost three-fold increase in 90-day mortality, compared to HIC (9.4% vs 3.7%, p < 0.001). On adjusted analysis, LMIC were independently associated with higher 90-day mortality (OR: 2.31, CI $_{95\%}$: 1.17-4.55, p =0.015). However, LMIC were not independently associated with higher rates of anastomotic leaks (OR: 1.06, CI $_{95\%}$: 0.57-1.99, p=0.9) or major complications (OR: 0.85, CI $_{95\%}$: 0.54-1.32, p=0.5), compared to HIC.

Conclusion: Resections in LMIC were independently associated with higher 90-day postoperative mortality, likely reflecting a failure to rescue of these patients following esophagectomy, despite similar composite anastomotic leaks and major complication rates to HIC. These findings warrant further research, to identify potential issues and solutions to improve global outcomes following esophagectomy for cancer.

Keywords: Anastomotic leak, Esophagectomy, Global surgery, Postoperative mortality

Delaying surgery

DELAYING SURGERY FOR PATIENTS WITH A PREVIOUS SARS-COV-2 INFECTION

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GLOBAL GUIDANCE FOR SURGICAL CARE DURING THE COVID-19 PANDEMIC

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Background: Surgeons urgently need guidance on delivering surgical services safely and effectively during the COVID-19 pandemic. The aim was to identify the key domains to consider when developing pandemic preparedness plans for surgical services. Methods: A scoping search was conducted to identify published articles relating to the management of surgical patients during pandemics. Key informant interviews were conducted with surgeons and anaesthetists with direct experience of working during infectious disease outbreaks, in order to identify key challenges and solutions to delivering effective surgical services during the COVID-19 pandemic. Results: Thirteen articles were identified from the scoping search, and surgeons and anaesthetists representing 11 territories were interviewed. To mount an effective response to COVID-19, a pandemic response plan for surgical services should be developed in advance. Key domains that should be included are: provision of staff training (such as patient transfers, donning and doffing personal protection equipment, recognizing and managing COVID-19 infection); support for the overall hospital response to COVID-19 (reduction in non-urgent activities such as clinics, endoscopy, non-urgent elective surgery); establishment of a team-based approach for running emergency services; and recognition and management of COVID-19 infection in patients treated as an emergency and those who have had surgery. A backlog of procedures after the COVID-19 pandemic is inevitable, and

hospitals should plan how to address this effectively to ensure that patients with elective treatment have the best possible outcomes. Conclusion: Hospitals should prepare detailed context-specific pandemic preparedness plans addressing the identified domains. Specific guidance should be updated continuously to reflect emerging evidence during the COVID-19 pandemic.

OUTCOMES FROM ELECTIVE COLORECTAL CANCER SURGERY DURING THE SARS-COV-2 PANDEMIC

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Aim: This study aimed to describe the change in surgical practice and the impact of SARS-CoV-2 on mortality after surgical resection of colorectal cancer during the initial phases of the SARS-CoV-2 pandemic.

Method: This was an international cohort study of patients undergoing elective resection of colon or rectal cancer without preoperative suspicion of SARS-CoV-2. Centres entered data from their first recorded case of COVID-19 until 19 April 2020. The primary outcome was 30-day mortality. Secondary outcomes included anastomotic leak, postoperative SARS-CoV-2 and a comparison with prepandemic European Society of Coloproctology cohort data.

Results: Of 2073 patients in 40 countries, 1.3% (27/2073) had a defunctioning stoma, and 3.0% (63/2073) had an end stoma instead of an anastomosis. Thirty-day mortality was 1.8% (38/2073), the incidence of postoperative SARS-CoV-2 was 3.8% (78/2073), and the anastomotic leak rate was 4.9% (86/1738). Mortality was lowest in patients without a leak or SARS-CoV-2

(14/1601, 0.9%) and highest in patients with both a leak and SARS-CoV-2 (5/13, 38.5%). Mortality was independently associated with an anastomotic leak (adjusted odds ratio 6.01, 95% confidence interval 2.58–14.06), postoperative SARS-CoV-2 (16.90, 7.86–36.38), male sex (2.46, 1.01–5.93), age >70 years (2.87, 1.32–6.20) and advanced cancer stage (3.43, 1.16–10.21). Compared with prepandemic data, there were fewer anastomotic leaks (4.9% versus 7.7%) and an overall shorter length of stay (6 versus 7 days) but higher mortality (1.7% versus 1.1%).

Conclusion: Surgeons need to further mitigate against both SARS-CoV-2 and anastomotic leak when offering surgery during current and future COVID-19 waves based on patient, operative and organizational risks.

Keywords: COVID-19; SARS-CoV-2; cancer; colon cancer; pandemic; rectal cancer; surgery; surgical oncology

SURGICAL SITE INFECTION AFTER GASTROINTESTINAL SURGERY IN CHILDREN: AN INTERNATIONAL, MULTICENTRE, PROSPECTIVE COHORT STUDY

GlobalSurg Collaborative

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Introduction: surgical site infection (SSI) is one of the most common healthcare-associated infections (HAIs). However, there is a lack of data available about SSI in children worldwide, especially from low-income and middle-income countries. This study aimed to estimate SSI incidence in children and associations between SSI and morbidity across human development settings.

Methods: a multicentre, international, prospective, validated cohort study of children aged under 16 years undergoing clean-contaminated, contaminated or dirty gastrointestinal surgery. Any hospital in the world providing paediatric surgery was eligible to contribute data between January and July

2016. The primary outcome was the incidence of SSI by 30 days. Relationships between explanatory variables and SSI were examined using multilevel logistic regression. Countries were stratified into high development, middle development and low development groups using the United Nations Human Development Index (HDI).

Results: Of 1159 children across 181 hospitals in 51 countries, 523 (45 1%) children were from high HDI, 397 (34 2%) from middle HDI and 239 (20 6%) from low HDI countries. The 30-day SSI rate was 6.3% (33/523) in high HDI, 12 8% (51/397) in middle HDI and 24 7% (59/239) in low HDI countries. SSI was associated with a higher incidence of 30-day mortality, intervention, organ-space infection and other HAIs, with the highest rates seen in low HDI countries. The median length of stay in patients who had an SSI was longer (7.0 days), compared with 3.0 days in patients who did not have an SSI. Use of laparoscopy was associated with significantly lower SSI rates, even after accounting for HDI.

Conclusion: SSI odds in children are nearly four times greater in low HDI compared with high HDI countries. Policies to reduce SSI should be prioritised as part of the wider global agenda.

COVID-19-RELATED ABSENCE AMONG SURGEONS: DEVELOPMENT OF AN INTERNATIONAL SURGICAL WORKFORCE PREDICTION MODEL

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Background: During the initial COVID-19 outbreak, up to 28.4 million elective operations were cancelled worldwide, in part owing to concerns that

it would be unsustainable to maintain elective surgery capacity because of COVID-19-related surgeon absence. Although many hospitals are now recovering, surgical teams need strategies to prepare for future outbreaks. This study aimed to develop a framework to predict elective surgery capacity during future COVID-19 outbreaks. Methods: An international crosssectional study determined real-world COVID-19-related absence rates among surgeons. COVID-19- related absences included sickness, selfisolation, shielding, and caring for a family. To estimate elective surgical capacity during future outbreaks, an expert elicitation study was undertaken with senior surgeons to determine the minimum surgical staff required to provide surgical services while maintaining a range of elective surgery volumes (0, 25, 50 or 75 per cent). Results: Based on data from 364 hospitals across 65 countries, the COVID-19-related absence rate during the initial six (6) weeks of the outbreak ranged from 20.5 to 24.7 per cent (mean average fortnightly). In weeks 7-12, this decreased to 9.2-13.8 per cent. At all times during the COVID-19 outbreak, there was predicted to be sufficient surgical staff available to maintain at least 75 per cent of regular elective surgical volume. Overall, there was predicted capacity for surgeon redeployment to support the wider hospital response to COVID-19. Conclusion: This framework will inform elective surgical service planning during future COVID-19 outbreaks. In most settings, surgeon absence is unlikely to be the factor limiting elective surgery capacity.

BARRIERS TO INGUINAL HERNIA REPAIR IN GHANA: PROSPECTIVE, MULTI-CENTRE COHORT STUDY

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Journal of Medical and Biomedical Sciences, 7(1), 35-39, 2020.

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Inguinal hernia (IH) is the most common general surgical pathology in Ghana with hernia repair rate very low. The objective was to assess patientperceived barriers to IH repair in Ghana and identify predictors of experiencing delays until surgery. A multicenter prospective study was conducted during the Ghana Hernia Society outreach. Data regarding diagnosis using Kingsnorth's classification of IH, age of patients, duration of hernia, the reason for the delay in repair, insurance status, American Society of Anesthesiologists (ASA) class, travel distance, region, hospital, and waiting times were obtained from patients and folders. Multivariable linear regression models were constructed to analyze delay until surgery and Kingsnorth's classification while controlling for the covariates of age, insurance status, ASA class among others. The most common reasons were queues for surgery (23%), poverty (10%), and seeking traditional medicine (9%). On multivariate linear regression, increasing age and ASA class III were predictors of longer delays. Patients experienced significant increase of 1.1 years delay to surgery for every 10 year increase in of age. ASA Class III patients were significantly more likely to be delayed by 11.5 years compared to ASA Class I patients. Efforts should be made to address and overcome the barriers to IH repair identified.

Key words: Inguinal hernia, hernia repair, Kingnorth's classification of inguinal hernia, poverty

FAVOURABLE PERIOPERATIVE OUTCOMES FOR CHILDREN WITH SARS-COV-2

COVIDSurg Collaborative and the Global Initiative for Children's Surgery (GICS)*

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KNOWLEDGE OF BREAST CANCER RISK FACTORS AND PRACTICES OF BREAST SELF-EXAMINATION AMONG WOMEN IN NORTHERN GHANA

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Introduction: Breast cancer remains a major global health concern in both developed and developing countries. The current study aimed to assess the knowledge of breast cancer (BC) and the practice of breast self-examination

(BSE) among females in the Tamale Metropolis of Northern Ghana. Methods: This is a cross-sectional study involving 1122 participants; consisting of nurses 157 (14.1%), teachers 227 (20.2%), undergraduate university students 339 (30.5%), medical students 95 (8.5%) and market women 304 (27.3%). Using a convenience sampling method to select the participants, we distributed questionnaires to participants; all were completed and returned. Results: Most of the participants, 498 (44.4%), were between 19-25 years of age. The majority were enlightened about BC (93.1%) and BSE (87.6%), 723 (64%) had good knowledge about the risk factors of BC. A total of 857 (76.4%) had previously been taught BSE. However, only 417 (37.2%) were found to practice BSE regularly. Conclusion: The knowledge of BC risk factors and BSE was remarkable but varied in the various occupational categories. However, only a few participants practiced BSE regularly. There is a need for widespread educational campaigns to educate further and encourage women to practice BSE regularly. The inclusion of men in these crusades is long overdue. Equipped with BSE's knowledge and skills, men could assist and encourage their spouses to frequently examine themselves. Further research studies will be necessary to ascertain the role of men in championing BSE among their significant others.

Keywords: awareness, breast cancer, breast self-examination, knowledge, practice, Ghana, Tamale

INCREASING THE USE OF CONTINUING PROFESSIONAL DEVELOPMENT COURSES TO STRENGTHEN TRAUMA CARE IN GHANA

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Injury is a major cause of death and disability in Ghana. Strengthening care of the injured is essential to reduce this burden. Trauma continuing professional development (CPD) courses are an important component of strengthening trauma care. In many countries, including Ghana, their use needs to be more uniformly promoted. We propose low-cost strategies to increase the utilization of trauma CPD in Ghana, especially in district hospitals and higher need areas. These strategies include developing plans by regional health directorates and teaching hospitals for the regions for which they are responsible. Lists could be kept and monitored of which hospitals have doctors with which type of training. Those hospitals that need to have at least one doctor trained could be flagged for notice of upcoming courses in the area and especially encouraged to have the needed doctors attend. The targets should include at least one surgeon or one emergency physician at all regional or large district hospitals who have taken the Advanced Trauma Life Support (ATLS) (or locally-developed alternative) in the past four years. Each district hospital should have at least one doctor who has taken the Primary Trauma Care (PTC) or Trauma Evaluation and Management (TEAM) (or locally-developed alternatives) in the past four years. Parallel measures would increase enrollment in the courses during training, such as promoting TEAM for all medical students and ATLS for all surgery residents. It is vital to develop and utilize more "homegrown" alternatives to increase the long-term sustainability of these efforts.

Keywords: trauma, injury, education, training, continuing professional development

MORTALITY AND PULMONARY COMPLICATIONS IN PATIENTS UNDERGOING SURGERY WITH PERIOPERATIVE SARS-COV-2 INFECTION: AN INTERNATIONAL COHORT STUDY

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Background: the impact of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on postoperative recovery needs to be understood to inform clinical decision making during and after the COVID-19 pandemic. This study reports 30-day mortality and pulmonary complication rates in patients with perioperative SARS-CoV-2 infection.

Methods: This international, multicentre cohort study at 235 hospitals in 24 countries included all patients undergoing surgery who had SARS-CoV-2 infection confirmed within seven days before or 30 days after surgery. The primary outcome measure was 30-day postoperative mortality and was assessed in all enrolled patients. The main secondary outcome measure was pulmonary complications, defined as pneumonia, acute respiratory distress syndrome, or unexpected postoperative ventilation.

Findings: this analysis includes 1128 patients who had surgery between Jan 1 and March 31, 2020, of whom 835 (74 0%) had emergency surgery, and 280 (24 8%) had elective surgery. SARS-CoV-2 infection was confirmed preoperatively in 294 (26 1%) patients. 30-day mortality was 23 8% (268 of 1128). Pulmonary complications occurred in 577 (51 2%) of 1128 patients; 30-day mortality in these patients was 38 0% (219 of 577), accounting for 82 6% (219 of 265) of all deaths. In adjusted analyses, 30-day mortality was associated with male sex (odds ratio 1 75 [95% CI 1 28–2 40], p<0 0001), American Society of Anesthesiologists grades 3–5 versus grades 1–2 (2 35)

[1 57–3 53], p<0 0001), malignant versus benign or obstetric diagnosis (1 55 [1 01–2 39], p=0 046), emergency versus elective surgery (1 67 [1 06–2 63], p=0 026), and major versus minor surgery (1 52 [1 01–2 31], p=0 047). Interpretation: Postoperative pulmonary complications occur in half of the patients with perioperative SARS-CoV-2 infection and are associated with high mortality. Thresholds for surgery during the COVID-19 pandemic should be higher than during normal practice, particularly in men aged 70 years and older. Consideration should be given for postponing non-urgent procedures and promoting non-operative treatment to delay or avoid the

COVID-19 PREPAREDNESS WITHIN THE SURGICAL, OBSTETRIC, AND ANESTHETIC ECOSYSTEM IN SUB-SAHARAN AFRICA

need for surgery.

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PANDEMIC: GLOBAL PREDICTIVE MODELLING TO INFORM SURGICAL RECOVERY PLANS

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British Journal of Surgery, 107(11), 1440-1449, 2020.doi: 10.1002/bjs.11746

Background: The COVID-19 pandemic has disrupted routine hospital services globally. This study estimated the total number of adult elective operations cancelled worldwide during the 12 weeks of peak disruption due to COVID-19. Methods: A global expert response study was conducted to elicit projections for the proportion of elective surgery that would be cancelled or postponed during the 12 weeks of peak disruption. A Bayesian β-regression model was used to estimate 12-week cancellation rates for 190 countries. Elective surgical case-mix data, stratified by specialty and indication (surgery for cancer versus benign disease), were determined. This case mix was applied to country-level surgical volumes. The 12-week cancellation rates were then applied to these figures to calculate the total number of cancelled operations. Results: The best estimate was that 28 404 603 operations would be cancelled or postponed during the peak 12 weeks of disruption due to COVID-19 (2 367 050 operations per week). Most would be operations for benign disease (90.2 per cent, 25 638 922 of 28 404 603). The overall 12-week cancellation rate would be 72.3 per cent. Globally, 81.7 per cent of operations for benign conditions (25 638 922 of 31 378 062), 37.7 per cent of cancer operations (2 324 070 of 6 162 311) and 25.4 per cent of elective caesarean sections (441 611 of 1 735 483) would be cancelled or postponed. If countries increased their normal surgical volume by 20 per cent after the pandemic, it would take a median of 45 weeks to clear the backlog of operations resulting from COVID-19 disruption. Conclusion: Many operations will be cancelled or postponed due to disruption caused by COVID-19. Governments should mitigate against this major burden on patients by developing recovery plans and implementing strategies to restore surgical activity safely.

BURDEN OF NEONATAL SURGICAL CONDITIONS IN NORTHERN GHANA

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Background: Congenital anomalies have risen to become the fifth leading cause of under-five mortality globally. The majority of deaths and disability occur in low- and middle-income countries including Ghana. This 3-year retrospective review aimed to define, for the first time, the characteristics and outcomes of neonatal surgical conditions in northern Ghana. Methods: A retrospective study was conducted to include all admissions to the Tamale Teaching Hospital (TTH) neonatal intensive care unit (NICU) with surgical conditions between January 2014 and January 2017. Data were collected on demographics, diagnosis and outcomes. Descriptive analysis was performed on all data, and logistic regression was used to predict determinants of neonatal mortality. p\ 0.05 was deemed significant. Results: Three hundred and forty-seven neonates were included. Two hundred and sixty-one (75.2%)

were aged 7 days or less at presentation, with males (n = 177, 52%) slightly higher than females (n = 165, 48%). The majority were delivered by spontaneous vaginal delivery (n = 247, 88%); 191 (58%) were born in hospital. Congenital anomalies accounted for 302 (87%) of the neonatal surgical cases and 45 (96%) deaths. The most common anomalies were omphalocele (n = 48, 13.8%), imperforate anus (n = 34, 9.8%), intestinal obstruction (n = 29, 8.4%), spina bifida (n = 26, 7.5%) and hydrocephalus (n = 19, 5.5%). The overall mortality rate was 13.5%. Two-thirds of the deaths (n = 30) from congenital anomalies were conditions involving the digestive system with gastroschisis having the highest mortality of 88%. Omphalocele (n = 11, 23.4%), gastroschisis (n = 7, 14.9%) and imperforate anus (n = 6, 12.8%) contributed to the most deaths. On multivariate analysis, low birthweight was significantly associated with mortality (OR 3.59, CI 1.4-9.5, p = 0.009). Conclusion Congenital anomalies are a major global health problem associated with high neonatal mortality in Ghana. The highest burden in both caseload and mortality is attributed to congenital anomalies involving the digestive system, which should be targeted to improve outcomes.

POOLED ANALYSIS OF WHO SURGICAL SAFETY CHECKLIST USE AND MORTALITY AFTER EMERGENCY LAPAROTOMY

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British Journal of Surgery, 106(2), e103-e112, 2019. doi: 10.1002/bjs.11051

Background: The World Health Organization (WHO) Surgical Safety Checklist has fostered safe practice for 10 years, yet its place in emergency

surgery has not been assessed on a global scale. The aim of this study was to evaluate reported checklist use in emergency settings and examine the relationship with perioperative mortality in patients who had emergency laparotomy.

Methods: In two multinational cohort studies, adults undergoing emergency laparotomy were compared with those having elective gastrointestinal surgery. Relationships between reported checklist use and mortality were determined using multivariable logistic regression and bootstrapped simulation.

Results: Of 12 296 patients from 76 countries, 4843 underwent emergency laparotomy. After adjusting for patient and disease factors, checklist use before emergency laparotomy was more common in countries with a high Human Development Index (HDI) (2455 of 2741, 89·6 per cent) compared with that in countries with a middle (753 of 1242, 60·6 per cent; odds ratio (OR) 0·17, 95 per cent c.i. 0·14 to 0·21, P < 0·001) or low (363 of 860, 42·2 per cent; OR 0·08, 0·07 to 0·10, P < 0·001) HDI. Checklist use was less common in elective surgery than for emergency laparotomy in high-HDI countries (risk difference -9·4 (95 per cent c.i. -11·9 to -6·9) per cent; P < 0·001), but the relationship was reversed in low-HDI countries (+12·1 (+7·0 to +17·3) per cent; P < 0·001). In multivariable models, checklist use was associated with a lower 30-day perioperative mortality (OR 0·60, 0·50 to 0·73; P < 0·001). The greatest absolute benefit was seen for emergency surgery in Low- and Middle-HDI countries.

Conclusion: Checklist use in emergency laparotomy was associated with a significantly lower perioperative mortality rate. Checklist use in low-HDI countries was half that in high-HDI countries.

QUALITY AND OUTCOMES IN GLOBAL CANCER SURGERY: PROTOCOL FOR A MULTICENTRE, INTERNATIONAL, PROSPECTIVE COHORT STUDY (GLOBALSURG 3)

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Introduction: Empirical, observational data relating to the diagnosis, management and outcome of three common worldwide cancers requiring surgery is lacking. However, it has been demonstrated that patients in low/ middle-income countries undergoing surgery for cancer are at increased risk of death and major complications postoperatively. This study aims to determine the quality and outcomes of breast, gastric and colorectal cancer surgery worldwide. Methods and analysis: This multicentre, international prospective cohort study will be undertaken by any hospital providing emergency or elective surgical services for breast, gastric or colorectal cancer. Centres will collect observational data on consecutive patients undergoing primary emergency or elective surgery for breast, gastric or colorectal cancer during a 6-month period. The primary outcome is the incidence of mortality and major complication rate at 30 days after cancer surgery. Infrastructure and care processes in the treatment of these cancers worldwide will also be characterised. Ethics and dissemination This project will not affect clinical practice and has been classified as a clinical audit following a research ethics review. The protocol will be disseminated through the international GlobalSurg network.

Keywords: cancer; global surgery; mortality; perioperative care; perioperative complications; quality.

OUTCOMES AFTER INGUINAL HERNIA REPAIR WITH MESH PERFORMED BY MEDICAL DOCTORS AND SURGEONS IN GHANA

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Importance: Inguinal hernia is the most common general surgical condition globally. Although task-sharing of surgical care with non-surgeons represents one method to increase access to essential surgery, the safety and outcomes of this strategy are not well described for hernia repair.

Objective: To compare outcomes after inguinal hernia repair with mesh performed by medical doctors and surgeons in Ghana.

Design, Setting, and Participants: This prospective cohort study was conducted from February 15, 2017, to September 17, 2018, at the Volta Regional Hospital in Ho, Ghana. Following successfully completing a training course, three medical doctors and two surgeons performed inguinal hernia repair with mesh according to the Lichtenstein technique on 242 men with primary, reducible inguinal hernia.

Main Outcomes and Measures: The primary endpoint was hernia recurrence at one year. The noninferiority limit was set at five percentage points. Secondary endpoints included postoperative complications at two weeks and patient satisfaction, pain, and self-assessed health status at one year.

Results: Two-hundred forty-two patients were included; 119 men underwent operations performed by medical doctors, and 123 men underwent operations performed by surgeons. Preoperative patient characteristics were similar in both groups. Two-hundred thirty-seven patients (97.9%) were seen at follow-up at two weeks, and 223 patients (92.1%) were seen at follow-up at one year. The absolute difference in recurrence rate between the medical doctor group (1 [0.9%]) and the surgeon group (3 [2.8%]) was -1.9 (1-tailed 95% CI, -4.8; P < .001), demonstrating noninferiority of the medical doctors. There were no statistically significant differences in postoperative complications (34 [29.1%] vs 29 [24.2%]), patient satisfaction (112 [98.2%] vs 108 [99.1%]), severe chronic pain (1 [0.9%] vs 4 [3.7%]), or self-assessed health (85.9 vs 83.7 of 100) for medical doctors and surgeons.

Conclusions and Relevance: this study shows that medical doctors can be trained to perform elective inguinal hernia repair with mesh in men with good results and high patient satisfaction in a low-resource setting. This finding supports surgical task sharing to combat the global burden of hernia disease.

GLOBAL BURDEN OF POSTOPERATIVE DEATH

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BARRIERS TO TIMELY PRESENTATION OF PATIENTS WITH SURGICAL CONDITIONS AT TAMALE TEACHING HOSPITAL IN NORTHERN GHANA

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Background: Improving access to surgical services and understanding the barriers to receiving timely care are necessary to save lives. This study aimed to assess barriers to timely presentation to an appropriate medical facility using the Three-Delay model, for patients presenting to Tamale Teaching Hospital in northern Ghana. Methods: In 2013, patients with delays in seeking surgical care were prospectively identified. Pairwise correlation coefficients between delay in presentation and factors associated with delay were conducted and served as a foundation for a multivariate log-linear regression model.

Results: A total of 718 patients presented with an average delay of 22.1 months. Delays in receiving care were most common (56.4%), while delays in seeking care were seen in 52.3% of patients. "Initially seeking treatment at the nearest facility, but appropriate care was unavailable" was reported by 56.4% and predicted longer delays (p<0.001). 42.9% of patients had delays secondary to treatment from a traditional or religious healer, which also predicted longer delays (p<0.001). On multivariate regression, emergent presentation was the strongest predictor of shorter delays (OR 0.058, p = 0.002), while treatment from a traditional or religious healer and initially

seeking treatment at another hospital predicted longer delays (OR 7.6, p = 0.008, and OR 4.3, p = 0.006, respectively). Conclusions Barriers to care leading to long delays in presentation are common in northern Ghana. Interventions should focus on educating traditional and religious healers in addition to building surgical capacity at district hospitals.

MANAGEMENT AND OUTCOMES OF GASTROINTESTINAL CONGENITAL ANOMALIES IN LOW, MIDDLE AND HIGH-INCOME COUNTRIES: PROTOCOL FOR A MULTICENTRE, INTERNATIONAL, PROSPECTIVE COHORT STUDY

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Introduction Congenital anomalies are the fifth leading cause of death in children <5 years of age globally, contributing to an estimated half a million deaths per year. Very limited literature exists from low and middle income countries (LMICs) where most of these deaths occur. The Global PaedSurg Research Collaboration aims to undertake the first multicentre, international, prospective cohort study of a selection of common congenital anomalies comparing management and outcomes between low, middle and High-Income Countries (HICs) globally. Methods and analysis The Global PaedSurg Research Collaboration consist of surgeons, paediatricians, anaesthetists and allied healthcare professionals involved in the surgical care of children globally. Collaborators will prospectively collect observational data on consecutive patients presenting for the first time, with one of seven anomalies (oesophageal congenital atresia, congenital common diaphragmatic hernia, intestinal atresia, gastroschisis, exomphalos, anorectal malformation and Hirschsprung's disease). Patient recruitment will be for a minimum of one month from October 2018 to April 2019 with a 30-day postprimary intervention follow-up period. Anonymous data will be collected on patient demographics, clinical status, interventions and outcomes using

REDCap. Collaborators will complete a survey regarding the resources and facilities for neonatal and paediatric surgery at their centre. The primary outcome is all-cause in-hospital mortality. Secondary outcomes include the occurrence of postoperative complications. The Chi-squared analysis will be used to compare mortality between LMICs and HICs. Multilevel, multivariate logistic regression analysis will be undertaken to identify patient-level and hospital-level factors affecting outcomes with adjustment for confounding factors. Ethics and dissemination at the host centre, this study is classified as an audit not requiring ethical approval. All participating collaborators have gained local approval in accordance with their institutional ethical regulations. Collaborators will be encouraged to present the results locally, nationally and internationally. The results will be submitted for open access publication in a peer-reviewed journal.

GLOBAL VARIATION IN ANASTOMOSIS AND END COLOSTOMY FORMATION FOLLOWING LEFT-SIDED COLORECTAL RESECTION

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Background: End colostomy rates following colorectal resection vary across institutions in high-income settings, being influenced by patient, disease, surgeon and system factors. This study aimed to assess global variation in end colostomy rates after left-sided colorectal resection.

Methods: This study comprised an analysis of GlobalSurg-1 and -2 international, prospective, observational cohort studies (2014, 2016), including consecutive adult patients undergoing elective or emergency left-

sided colorectal resection within discrete 2-week windows. According to the United Nations Human Development Index (HDI), countries were grouped into High-, middle- and low-income tertiles according to the United Nations Human Development Index (HDI). Factors associated with colostomy formation versus primary anastomosis were explored using a multilevel, multivariable logistic regression model.

Results: In total, 1635 patients from 242 hospitals in 57 countries undergoing left-sided colorectal resection were included: 113 (6·9 per cent) from low-HDI, 254 (15·5 per cent) from middle-HDI and 1268 (77·6 per cent) from high-HDI countries. There was a higher proportion of patients with perforated disease (57·5, 40·9 and 35·4 per cent; P < 0.001) and subsequent use of end colostomy (52·2, 24·8 and 18·9 per cent; P < 0.001) in low- compared with middle- and high-HDI settings. The association with colostomy use in low-HDI settings persisted (odds ratio (OR) 3·20, 95 per cent c.i. 1·35 to 7·57; P = 0.008) after risk adjustment for malignant disease (OR 2·34, 1·65 to 3·32; P < 0.001), emergency surgery (OR 4·08, 2·73 to 6·10; P < 0.001), time to operation at least 48 h (OR 1·99, 1·28 to 3·09; P = 0.002) and disease perforation (OR 4·00, 2·81 to 5·69; P < 0.001).

Conclusion: Global differences existed in the proportion of patients receiving end stomas after left-sided colorectal resection based on income, beyond case-mix alone.

PATIENT EXPERIENCE AND OUTCOMES OF THE LOCALLY ORGANIZED APRIDEC MEDICAL OUTREACH GROUP

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Background: Access to safe and effective surgery is limited in low and middle-income countries. Short-term surgical missions are a common platform to provide care, but the few published outcomes suggest unacceptable morbidity and mortality. We sought to study the safety and effectiveness of the ApriDec Medical Outreach Group (AMOG). Methods: Data from the December 2017 and April 2018 outreaches were prospectively collected. Patient demographics, characteristics of surgery, complications of the surgery, and patient quality of life were collected preoperatively and on postoperative days 15 and 30. Data were analyzed to determine complication rates and trends in quality of life. Results: 260/278 (93.5%) of patients completed a 30-day follow-up. Surgical site infection was the most common complication (8.0%), followed by hematoma (4.1%). Urinary tract infection rates were 1.2%, while all other complications occurred in less than 1% of patients. There were no mortalities. With increasing time after surgery (0 to 15 days to 30 days), there was a significant improvement across each dimension of quality of life (p \setminus 0.001). All patients reported satisfaction with their procedure. Conclusion: This study demonstrated that the care provided by the AMOG group to the underserved populations of northern Ghana yielded complication rates similar to others in low-resource communities, leading to improved quality of life.

MESH VERSUS SUTURE REPAIR OF PRIMARY INGUINAL HERNIA IN GHANA

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Background: Most patients in Ghana undergo suture repair for primary inguinal hernia. Although there is strong evidence from high-income country settings to indicate the superiority of mesh repair for inguinal hernia, the evidence to support the safety and effectiveness of mesh repair in the Ghanaian setting is limited. This study compared hernia recurrence rates following suture versus mesh repair in Ghana.

Methods: Men aged 18 years or over presenting with symptomatic, reducible inguinal hernias were included. Over the first six months, all consecutive patients were enrolled prospectively and underwent a standardized suture repair; an equal number of patients were subsequently enrolled to undergo mesh repair. The primary outcome was hernia recurrence within three years of the index operation. Multivariable analysis was adjusted for age and right

or left side. Adjusted odds ratios (ORs) with 95 per cent confidence intervals are reported.

Results: A total of 116 sutured and 116 mesh inguinal hernia repairs were performed. Three years after surgery, follow-up data were available for 206 of the 232 patients (88·8 per cent). Recurrence occurred significantly more frequently in the suture repair group (23 of 103, 22·3 per cent) than in the mesh group (7 of 103, 6·8 per cent) (P = 0.002). In multivariable analysis, suture repair was independently associated with an increased risk of recurrence (OR 4.51, 95 per cent c.i. 1·76 to 11.52; P = 0.002).

Conclusion: In Ghana, mesh inguinal hernia repair was associated with reduced 3-year recurrence compared with sutured repair. Controlled dissemination across Ghana should now be assessed.

TO REDUCE MORTALITY FROM GASTROSCHISIS IN LOW-RESOURCE SETTINGS

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Background: high-income countries and over 90% mortality in many tertiary paediatric surgery centres across sub-Saharan Africa (SSA). This trial aims to develop, implement and prospectively evaluate an interventional bundle to reduce mortality from gastroschisis in seven tertiary paediatric surgery centres across SSA. Methods: A hybrid type-2 effectiveness-implementation, pre-post study design will be utilised. Using current literature, an evidence-based, low-technology interventional bundle has been developed. A systematic review, qualitative study and Delphi process will provide further evidence to optimise the interventional bundle and implementation strategy. The interventional bundle has core components, which will remain consistent across all sites, and adaptable components, which will be determined through in-country co-development meetings. Pre- and post-intervention data will be collected on clinical, service delivery and implementation outcomes for 2-years at each site.

The primary clinical outcome will be all-cause, in-hospital mortality. Secondary outcomes include the occurrence of a major complication, length of hospital stay and time to full enteral feeds. Service delivery outcomes include time to hospital and primary intervention and adherence to the preand in-hospital protocols. hospital Implementation outcomes acceptability, adoption, appropriateness, feasibility, fidelity, coverage, cost and sustainability. Pre- and post-intervention clinical outcomes will be compared using Chi-squared analysis, unpaired t-test and/or Mann-Whitney test. Time-series analysis will be undertaken using Statistical Process Control to identify significant trends and shifts in outcome overtime. Multivariate logistic regression analysis will be used to identify clinical and implementation factors affecting outcomes with adjustment for confounders. Outcome: This will be the first multi-centre interventional study to our knowledge aimed at reducing mortality from gastroschisis in low-resource settings. If successful, detailed evaluation of both the clinical and implementation components of the study will allow sustainability in the study sites and further scale-up.

PRIORITIZING RESEARCH FOR PATIENTS REQUIRING SURGERY IN LOW- AND MIDDLE-INCOME COUNTRIES

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British Journal of Surgery, 106(2), e113-e120, 2019. doi: 10.1002/bjs.11037

Background: The National Institute for Health Research Global Health Research Unit on Global Surgery establishes research Hubs in Low- and Middle-Income Countries (LMICs). This study aimed for the Hubs to prioritize future research into areas of unmet clinical need for patients in LMICs requiring surgery.

Methods: A modified Delphi process was overseen by the research Hub leads and engaged LMIC clinicians, patients and expert methodologists. A four-stage iterative process was delivered to prioritize research topics. This included anonymous electronic voting, teleconference discussions and a 2-day priority-setting workshop.

Results: In stage 1, Hub leads proposed 32 topics across six domains: access to surgery, cancer, perioperative care, research methods, acute care surgery and communicable disease. In stages 2 and 3, 40 LMICs and 20 high-income countries participated in online voting, leading to the identification of three priority research topics: access to surgery, outcomes of cancer surgery, and perioperative care. During stage 4, specific research plans to address each topic were developed by Hub leads at a priority-setting workshop.

Conclusion: This process identified three priority areas for future research relevant to surgery in LMICs. It was driven by front-line LMIC clinicians, patients and other stakeholders representing a diverse range of settings. The results of the prioritization exercise provide a future framework for researchers and funders.

MANAGEMENT AND OUTCOMES FOLLOWING SURGERY FOR GASTROINTESTINAL TYPHOID: AN INTERNATIONAL, PROSPECTIVE, MULTICENTRE COHORT STUDY

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World Journal of Surgery, 42(10), 3179–3188, 2018. doi: 10.1007/s00268-018-4624-8

Background: Gastrointestinal perforation is the most severe complication of typhoid fever, with a high disease burden in low-income countries. Reliable, prospective, contemporary surgical outcome data are scarce in these settings. This study aimed to investigate surgical outcomes following surgery for intestinal typhoid.

Methods: Two multicentre, international prospective cohort studies of consecutive patients undergoing surgery for gastrointestinal typhoid perforation were conducted. Outcomes were measured at 30 days and included mortality, surgical site infection, organ space infection and reintervention rate. Multilevel logistic regression models were used to adjust for clinically plausible explanatory variables. Effect estimates are expressed as odds ratios (ORs) and corresponding 95% confidence intervals.

Results: A total of 88 patients across the GlobalSurg 1 and GlobalSurg 2 studies were included from 11 countries. Children comprised 38.6% (34/88) of included patients. Most patients (87/88) had intestinal perforation. The 30-day mortality rate was 9.1% (8/88), which was higher in children (14.7 vs 5.6%). Surgical site infection was common, at 67.0% (59/88). Organ site infection was common, with 10.2% of patients affected. An ASA grade of III and above was a strong predictor of 30-day postoperative mortality at the univariable level and following adjustment for explanatory variables (OR 15.82, 95% CI 1.53–163.57, p = 0.021). Conclusions With high mortality and complication rates, outcomes from surgery for intestinal typhoid remain poor. Future studies in this area should focus on sustainable interventions which can reduce perioperative morbidity. Improving these outcomes will require both surgical and public health system advances at a policy level.

PROPOFOL VERSUS PETHIDINE/MIDAZOLAM SEDATION: BENEFITS IN FLEXIBLE UPPER GASTROINTESTINAL ENDOSCOPY

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Journal of Anesthesiology, 10(11), 2018. https://doi.org/10.1186/s42077-018-0013-7

Background: There is a lack of evidence comparing propofol as a single agent with pethidine/ midazolam combined for sedation in upper gastrointestinal (GI) endoscopy in developing countries. This study aimed to compare the benefits of sedation using propofol as a single agent to pethidine combined with midazolam in Ghana.

Methods: During the first six months of this study, all patients (137) undergoing diagnostic upper GI endoscopy at the Tamale Teaching Hospital (TTH) received pethidine/midazolam, and in the following 6 months, all patients (104) received propofol. A total of 241 patients were enrolled in the study. The duration of the procedure and recovery time were recorded, and a structured questionnaire was then administered to determine patient satisfaction, level of sedation and amnesia.

Results: The mean time of recovery from sedation was significantly lower in the propofol group than in the pethidine and midazolam group (12.6 min vs 33.7 min; p < 0.001). The duration of the procedure was significantly shorter by 4.4 min in the propofol group compared to the pethidine/midazolam group (4.6 min vs. 8.9 min p < 0.001). There was no association between the sedation method and the level of satisfaction (p = 0.653).

Conclusion: The use of propofol for conscious sedation during flexible upper gastrointestinal endoscopy is superior compared to the combined midazolam

and pethidine in terms of benefits. The cost of propofol is slightly cheaper than combined midazolam and pethidine.

Keywords: Sedation, Endoscopy, Satisfaction

SURGICAL SITE INFECTION AFTER GASTROINTESTINAL SURGERY IN HIGH-INCOME, MIDDLE-INCOME, AND LOW-INCOME COUNTRIES: A PROSPECTIVE, INTERNATIONAL, MULTICENTRE COHORT STUDY

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Background: Surgical site infection (SSI) is one of the most common infections associated with health care, but its importance as a global health priority is not fully understood. We quantified the burden of SSI after gastrointestinal surgery in countries in all parts of the world. Methods: This international, prospective, multicentre cohort study included consecutive patients undergoing elective or emergency gastrointestinal resection within 2-week at any healthcare facility in any country. Countries with participating centres were stratified into high-income, middle-income, and low-income groups according to the UN's Human Development Index (HDI). Data variables from the GlobalSurg 1 study and other studies that have been found to affect the likelihood of SSI were entered into risk adjustment models. The primary outcome measure was the 30-day SSI incidence (defined by US Centers for Disease Control and Prevention criteria for superficial and deep incisional SSI). Relationships with explanatory variables were examined using Bayesian multilevel logistic regression models. This

trial is registered with ClinicalTrials.gov, number NCT02662231. Findings: Between Jan 4, 2016, and July 31, 2016, 13265 records were submitted for analysis. Twelve thousand five hundred thirty-nine patients from 343 hospitals in 66 countries were included. 7339 (58.5%) patients were from high-HDI countries (193 hospitals in 30 countries), 3918 (312%) patients were from middle-HDI countries (82 hospitals in 18 countries), and 1282 (10.2%) patients were from low-HDI countries (68 hospitals in 18 countries). 1538 (12 3%) patients had SSI within 30 days of surgery. The incidence of SSI varied between countries with high (691 [9 4%] of 7339 patients), middle (549 [14 0%] of 3918 patients), and low (298 [23 2%] of 1282) HDI (p<0 001). The highest SSI incidence in each HDI group was after dirty surgery (102 [17 8%] of 574 patients in high-HDI countries; 74 [31 4%] of 236 patients in middle-HDI countries; 72 [39 8%] of 181 patients in low-HDI countries). Following risk factor adjustment, patients in low-HDI countries were at the greatest risk of SSI (adjusted odds ratio 1 60, 95% credible interval 1 05-2 37; p=0 030). 132 (21 6%) of 610 patients with an SSI and a microbiology culture result had an infection that was resistant to the prophylactic antibiotic used. Resistant infections were detected in 49 (16 6%) of 295 patients in high-HDI countries, in 37 (198%) of 187 patients in middle-HDI countries, and in 46 (359%) of 128 patients in low-HDI countries (p<0 001). Interpretation: Countries with a low HDI carry a disproportionately greater burden of SSI than countries with a middle or high HDI and might have higher rates of antibiotic resistance. In view of WHO recommendations on SSI prevention that highlight the absence of high-quality interventional research, urgent, pragmatic, randomised trials based in LMICs are needed to assess measures aiming to reduce this preventable complication.

LOCAL ANESTHESIA UNDERUTILIZED FOR INGUINAL HERNIA REPAIR IN NORTHERN GHANA

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Introduction: Inguinal hernia repair is a common procedure and a priority for public health efforts in Ghana. It is essential that inguinal hernia repair be performed in a safe, efficient manner to justify its widespread use. Local anesthesia has many favorable properties and has been shown to be superior, compared to regional or general anesthesia, in terms of pain control, safety profile, cost-effectiveness, resources required, and time to discharge. Local anesthesia is recommended for open repair of reducible hernias, provided clinician experience, by multiple international guidelines. Regional anesthesia is associated with myocardial infarction and other complications, and its use is discouraged by multiple guidelines, especially in older patients. This study aims to assess the current state of anesthesia for inguinal hernia repair in the northern and transitional zone of Ghana. In addition we will assess the perceptions of different types of anesthesia along with understanding of evidence-based guidelines among clinicians participating in inguinal hernia repair.

Methods: We performed a retrospective review of all inguinal hernia repairs for male patients, 18 and older, in over 90% of hospitals in northern Ghana. All 41 hospitals were visited and caselogs and patient charts were manually reviewed to extract data. Multivariate logistic regression was used to determine predictors of local anesthesia use. We designed a survey instrument to assess the perceptions of physicians and anesthetists regarding different types of anesthesia for inguinal hernia repair. The survey was designed by a Ghanaian surgeon, reviewed by all co-authors, and tested prior to implementation using a sample (n = 8) of clinicians having similar practices to those of the survey population. Of 70 clinicians, 66 responded, yielding a response rate of 94%.

Results: 8080 patients underwent hernia repair of which 37% were performed under local anesthesia, while the majority, 60%, were performed under regional anesthesia. Negative predictors of local anesthesia were emergent repair (OR = 0.258, p < 0.001), surgery performed at a teaching hospital (OR = 0.105, p < 0.001), and bilateral hernia repair (OR = 0.374, p < 0.001). 1,839 (22.8%) of IH repairs were done on patients age 65 or older and RA was most frequently used among the elderly population (57.8%), while local anesthesia was used 39.5% of the time. Sixty-six clinicians participated in the survey with the majority reporting that local anesthesia requires fewer staff, less equipment, has a shorter recovery, is more cost-effective, and might be safer for patients. However 66% were unfamiliar with or incorrectly perceived international guidelines.

Conclusion: To our knowledge, this study is the largest assessment of anesthesia use for inguinal hernia repair in an LMIC. Although the selection of anesthetic technique should be guided by a patient's general health, the anatomy of the hernia, and clinician judgment, local anesthesia appears to be underutilized in northern Ghana. Survey responses demonstrate high rates of unfamiliarity or incorrectly perceived evidence-based guidelines. Future research should assess how education on the benefits and technique of local anesthesia administration may further increase rates for inguinal hernia repair, especially for older patients.

HELICOBACTER PYLORI ASSOCIATION WITH UPPER GASTROINTESTINAL PATHOLOGIES IN NORTHERN GHANA

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Background: Pathologies of Helicobacter pylori infection show distinct regional patterns and are unclassified for Northern Ghana. Materials and Methods: Demographic and clinical data of 1580 patients who underwent upper gastrointestinal endoscopy (Tamale Teaching Hospital) were assessed. Results: The prevalence of H. pylori infection was 73.4%. Patients 31-50 years-old and >50 years-old had significantly more positive H. pylori tests than the ≤30 year-olds (odds ratios [ORs] [95% confidence interval [CIs]]: 8.6 [6.637-11.22] and 6.1 [4.609-8.203]; both, P < 0.0001). Presenting symptoms were epigastric pain (67.3%), abdominal pain (21.5%), hematemesis (7.6%), and dysphagia (2.0%). H. pylori was diagnosed in 72.5% of patients with duodenal ulcers and 77.0% with gastric ulcers (n = 444). Gastric ulcer was significantly associated with H. pylori (OR [95% CI]: 1.3 [1.01-1.69], P = 0.042), and gastritis showed a positive but not statistically significant association. Conclusions: In Northern Ghana, H. pylori infection is associated with gastritis, gastric ulcer, and duodenal ulcer and is most common in middle-aged adults (31–50 years old).

Keywords: Endoscopy, gastrointestinal pathology, *Helicobacter pylori* infection, Northern Ghana

THE USE OF MESH FOR INGUINAL HERNIA REPAIR IN NORTHERN GHANA

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Background: Despite the recognition that inguinal hernia (IH) repair is cost-effective, repair rates in lLw- and Middle-Income Countries remain low. The estimated use of mesh in Low- and Middle-Income countries also remains low despite publications about low-cost, noncommercial mesh. Our study aimed to assess the current state of IH repair in the northern and transitional zone of Ghana.

Materials and methods: A retrospective review of surgical case logs of IH repairs from 2013 to 2017 in 41 hospitals was performed. Multivariate logistic regression was used to determine predictors of mesh use.

Results: Eight thousand eighty male patients underwent IH repair. The range of IH repair in each region was 96 to 295 (overall 123) per 100,000 population. Most cases were performed at district hospitals (84%) and repaired electively (93%) by non-surgeon physicians (66%). Suture repair was most common (85%), although mesh was used in 15%. The strongest predictor of mesh use was when a surgeon performed surgery (odds ratio [OR] 3.13, P <0.001), followed by the surgery being performed in a teaching hospital (OR 2.31, P <0.001). Repair at a regional hospital was a negative predictor of mesh use (OR 0.08, P <0.001) as was the use of general anesthesia (OR 0.40, P = 0.001).

Conclusions: Most IH repairs are performed in district hospitals by nonsurgeon physicians without mesh. Rates of repair and the use of mesh are

higher than previous estimates in Ghana and Sub-Saharan Africa but not as high as in High-Income Countries.

Keywords: Ghana; Global surgery; Groin hernia repair; Hernia mesh; Inguinal hernia repair; Noncommercial hernia mesh.

LAPAROSCOPY IN MANAGEMENT OF APPENDICITIS IN HIGH-, MIDDLE-, AND LOW-INCOME COUNTRIES: A MULTICENTER, PROSPECTIVE, COHORT STUDY

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Surgical Endoscopy, 32(8),3450-3466, 2018. doi: 10.1007/s00464-018-6064-9

Background: Appendicitis is the most common abdominal surgical emergency worldwide. Differences between high- and low-income settings in the availability of laparoscopic appendectomy, alternative management choices, and outcomes are poorly described. The aim was to identify variation in surgical management and outcomes of appendicitis within low-, middle-, and high-Human Development Index (HDI) countries worldwide. Methods: This is a multicenter, international prospective cohort study. Consecutive sampling of patients undergoing emergency appendectomy over six months was conducted. Follow-up lasted 30 days. Results: 4546 patients from 52 countries underwent appendectomy (2499 high-, 1540 middle-, and 507 low-HDI groups). Surgical site infection (SSI) rates were higher in low-HDI (OR 2.57, 95% CI 1.33–4.99, p=0.005) but not in middle-HDI countries (OR 1.38, 95% CI 0.76–2.52, p=0.291), compared with high-HDI countries after adjustment. A laparoscopic approach was common in high-HDI countries (1693/2499, 67.7%) but infrequent in low-HDI (41/507, 8.1%)

and middle-HDI (132/1540, 8.6%) groups. After accounting for case-mix, laparoscopy was still associated with fewer overall complications (OR 0.55, 95% CI 0.42–0.71, p< 0.001) and SSIs (OR 0.22, 95% CI 0.14–0.33, p< 0.001). In propensity-score matched groups within low-/middle-HDI countries, laparoscopy was associated with fewer complications (OR 0.23 95% CI 0.11–0.44) and SSI (OR 0.21 95% CI 0.09–0.45). Conclusion: A laparoscopic approach is associated with better outcomes, and availability appears to differ by country HDI. Despite the profound clinical, operational, and financial barriers to its widespread introduction, laparoscopy could significantly improve outcomes for patients in low-resource environments **Keywords:** Appendicitis · Appendectomy · Global surgery · Laparoscopic · Operative standards · Postoperative care · Postoperative complications · Surgical site infection

BASELINE STUDY OF CANCER PATTERNS IN THE DEPARTMENT OF PATHOLOGY OF THE TAMALE TEACHING HOSPITAL, NORTHERN REGION OF GHANA

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Background: Documentation of baseline data in any newly established academic or health institution is a prerequisite for future research. The histopathological review aimed to describe the patterns and the relative proportions of the various cancers diagnosed in the Department of Pathology, Tamale Teaching Hospital (TTH) to be used as baseline data for future research.

Materials and Methods: This retrospective review was conducted from 1st June 2011 to 30th June 2016 in the Department. Data were analysed using SPSS software version 23.0 (Chicago). Fisher's exact test was used to compare common cancers. Results: A total of 715 cancer cases were reviewed, the majority were females 534 [(76.7%), (p< 0.0001)], with female to male ratio of 3:1. The mean age of males was 49.9±21.6 years compared to 48.7±17.5 years for females. Common male cancers were: gastric (17.7%), soft tissue (12.2%), larynx (9.9%), bone (8.8%) and prostate (8.3%); while for the females were: breast (33.5%), cervix (31.1%), ovary (7.3%), gastric (3.9%) and uterus (3.7%). Male genital tract cancers were: prostate (65.2%), penis (26.1%), testis (4.3%) and scrotum (4.3%). Cancers of the female reproductive system were: cervix (70.3%), ovary (16.5%), uterus (8.5%), vagina (2.6%), vulva (1.7%) and fallopian tube (0.4%). A total of 454 (63.5%) cancers occurred in both males and females. Among all the cases, 65.6% were occurred in females (p< 0.0001), particularly in breast [(96.3%), p< 0.0001], the urinary system [(56.0%), p= 0.5721] and conjunctiva/orbital [(62.5%), p= 0.6193]. Conclusion: Cancers were found to be common among relatively young females. Breast, urinary system, conjunctiva, and orbital malignancies were significantly common in females.

Keywords: Male and female cancers; baseline study; Tamale; Ghana; future research.

SURGICAL SITE INFECTIONS IN EMERGENCY ABDOMINAL SURGERY AT TAMALE TEACHING HOSPITAL, GHANA

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World Journal of Surgery, 42(4), 916–922, 2018. doi: 10.1007/s00268-017-4241-y

Background: Surgical site infections (SSIs) result in delayed wound healing, increased use of antibiotics and increased length of hospital stay, putting a tremendous physical and financial burden on patients, their relatives and the healthcare facilities. Patient-related factors, such as pre-existing colonization with antibiotic-resistant bacteria, and clinical-related factors, such as adherence to sterile techniques, contribute to the development of SSIs. Therefore, the objective of this study was to determine the SSI rate and risk factors for emergency abdominal surgeries at Tamale Teaching Hospital, Ghana.

Methods: The study population was composed of patients undergoing emergency abdominal surgery at the Tamale Teaching Hospital between June 2010 and June 2015. Demographic and clinical data were collected and included but were not limited to patient age and sex, type of procedure performed, wound class (dirty or contaminated), receipt of perioperative blood transfusion, American Society of Anesthesiologists (ASA) score, presence of SSI, length of hospital stay and outcome of surgery. Standard multiple regression was used to statistically assess the independent variables for their association with SSI, and the Pearson correlation coefficient was used to determine the strength of association. The beta (β) values, which had the most significant influence on the overall SSI, indicated the relative impact of the entered variable(s).

Results: A total of 1011 patients underwent various emergency abdominal surgical procedures during the study period. The β values were 0.008 for perioperative blood transfusion, 0.050 for sex, – 0.048 for ASA risk, – 0.001 for having health insurance, 0.037 for being referred from another health

facility and 0.034 for age. Sex was the most distinctive contributor to SSI, while perioperative blood transfusion showed the least influence. Sex and ASA score were the best predictors of SSI occurrence. The coefficients of the P values for wound class and serum haemoglobin level (g/dL) were 0.000 and 0.032, respectively. The outcome of surgery was significantly and strongly associated with overall SSI and vice versa (r = 0.088, P < 0.01 two-tailed).

Conclusion: sex, ASA score, perioperative blood transfusion, wound class and haemoglobin level can predispose to SSI.

MIXED-METHODS ASSESSMENT OF A PILOT DECENTRALIZED SURGICAL TRAINING PROGRAM FOR HOUSE OFFICERS IN GHANA

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Postgraduate Medical Journal, 7(1), 2018.

Introduction: There is a critical surgical workforce gap in low- and middle-income countries, particularly at first-level referral (i.e. district) hospitals. We piloted a decentralized surgical training program for house officers at a district hospital in Ghana to address this gap.

Methods: Six house officers took part in the pilot program. Trainees participated in: i) didactic, video-based, and practical modules; ii) intensive

surgical immersion at a district hospital with consultant surgeon oversight; and iii) a 12-month supervised rotation as a surgical care provider at a district hospital. Case-mix and volume, complications, and perioperative mortality rate during the program were tracked. Anonymous feedback from the trainees was analysed with a content analysis framework.

Results: In the 12-month pilot training program, six trainees were actively involved in carrying out 606 procedures independently, under supervision or as an assistant (mean: 101 procedures/trainee). The most frequent preoperative diagnoses were hernia and complications of labour (432, 71.3%), followed by acute abdomen requiring laparotomy (85, 14.0%), soft tissue mass (21, 3.5%), hemopneumothorax or pleural effusion (19, 3.1%), hydrocele (16, 2.6%), abscess (12, 2.0%) and other (47, 7.8%). Twenty-three (3.8%) patients experienced complications, with the most common being surgical site infections (superficial: 8, 1.3%; deep: 3, 0.5%). The perioperative mortality rate was 1.2%. Feedback from trainees was generally positive, but revealed several unmet challenges.

Conclusion: Through the decentralized surgical training program Ghanaian trainees gained useful experience with essential surgical care at a first-level hospital and provided timely surgical care to patients.

Keywords: Medical officers, House officers, Decentralization, Surgical Training

OUR EXPERIENCE WITH THE USE OF LOW COST MESH IN TENSION-FREE INGUINAL HERNIOPLASTY IN NORTHERN GHANA

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Objectives: To describe our experience and success in the use of low-cost mesh for the repair of inguinal hernias in consenting adult patients

Methods: A prospective study was carried out from August 2010 to December 2013 in ten district hospitals across Northern Ghana. The patients were divided into four groups according to Kingsnorth's classification of hernias. The low-cost mesh was used to repair uncomplicated groin hernia. Those hernias associated with complications were excluded. We assessed the patients for wound infection, long term incisional pain and recurrence of the hernia. The data collected was entered, cleaned, validated and analyzed.

Results: One hundred and eighty-four patients had tension-free repair of their inguinal hernias using non-insecticide impregnated mosquito net mesh. The median age of the patients was 51 years. The male to female ratio was 7:1. Using Kingsnorth's classification, H3 hernias were (62, 33.7%), followed by the H1 group (56, 30.4%). Local anaesthesia was used in 70%, and less than 5% had general anaesthesia. The cost of low-cost mesh to each patient was calculated to be \$ 1.8(GH¢7.2) vs \$ 45(GH¢ 180) for a commercial mesh of the same size. The benefit to the patient and the facility was enormous. Wound hematoma was noticed in 7%, while superficial surgical site infection was 3%. No patient reported of long term wound pain. There was no recurrence of hernia.

Conclusion: Low-cost mesh such as sterilized mosquito net mesh for use in hernioplasty in resource-limited settings is reasonable, acceptable and costeffective. It should be widely propagated.

Keywords: Northern Ghana; hernioplasty; low cost mesh.

ASSESSMENT OF THE ENVIRONMENTAL RISK FACTORS FOR A GASTRIC ULCER IN THE NORTHERN GHANA

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Numerous risk factors have been implicated in the development of a gastric ulcer. These common risk factors include Helicobacter pylori infection, chronic non-steroidal anti-inflammatory intake, and alcohol consumption. This study aimed to identify environmental risk factors associated with a gastric ulcer in northern Ghana. The data for this retrospective study were obtained from 2035 patient records from the Minimal Access Therapy and Operative Endoscopy Unit of the Tamale Teaching Hospital in Tamale, Ghana, from 2010 to 2014. A separate questionnaire was administered to assess the environmental risk factors. The rapid urease test was used to determine the presence of H. pylori. The Statistical Package for Social Sciences version 20.0 was used to analyse the data. Univariate and bivariate analyses were performed, and the results were presented in the tables provided. The Chi-square values of the bivariate analysis were considered statistically significant when P < 0.05. Bivariate analysis revealed a strong association between gastric ulcer and various risk factors such as smoking (P = 0.001, χ 2 = 27.3), fasting (P = 0.001, χ 2 = 42.6), H. pylori infection (P = 0.01, $\chi 2$ = 19.9), and alcohol consumption (P = 0.001, $\chi 2$ = 30.6). There was no

association between the traditional herbal preparation usage (P = 0.251, χ 2 = 1.8) and the gastric ulcer. Environmental risk factors responsible for developing a gastric ulcer in people of the northern part of Ghana show a similar pattern to other geographical regions of the world.

Keywords: Gastric ulcer disease, dyspepsia, H. pylori infection, endoscopy

MORTALITY OF EMERGENCY ABDOMINAL SURGERY IN HIGH-, MIDDLE- AND LOW-INCOME COUNTRIES

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British Journal of Surgery, 103(8), 971–988, 2016. doi: 10.1002/bjs.10151

Background: Surgical mortality data are collected routinely in high-income countries, yet virtually no low- or middle-income countries have outcome surveillance in place. The aim was prospectively to collect worldwide mortality data following emergency abdominal surgery, comparing findings across countries with a low, middle or high Human Development Index (HDI). Methods: This was a prospective, multicentre, cohort study. Selfselected hospitals performing emergency surgery submitted prespecified data for consecutive patients from at least one 2-week interval during July to December 2014. Postoperative mortality was analysed by hierarchical multivariable logistic regression. Results: Data were obtained for 10 745 patients from 357 centres in 58 countries; 6538 were from high-, 2889 from middle- and 1318 from low-HDI settings. The overall mortality rate was 1.6 per cent at 24 h (high 1·1 per cent, middle 1·9 per cent, low 3·4 per cent; P < 0.001), increasing to 5.4 per cent by 30 days (high 4.5 per cent, middle 6.0 per cent, low 8.6 per cent; P < 0.001). Of the 578 patients who died, 404 (69.9 per cent) did so between 24 h and 30 days following surgery (high 74.2 per cent,

middle 68·8 per cent, low 60·5 per cent). After adjustment, 30-day mortality remained higher in middle-income (odds ratio (OR) 2·78, 95 per cent c.i. 1·84 to 4·20) and low-income (OR 2·97, 1·84 to 4·81) countries. Surgical safety checklist use was less frequent in Low- and Middle-income Countries but was associated with reduced mortality at 30 days when used. Conclusion: Mortality is three times higher in low- compared with high-HDI countries even when adjusted for prognostic factors. Patient safety factors may have an important role.

DETERMINANTS OF MORBIDITY AND MORTALITY FOLLOWING EMERGENCY ABDOMINAL SURGERY IN CHILDREN IN LOW-INCOME AND MIDDLE-INCOME COUNTRIES

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Background: Child health is a key priority on the global health agenda, yet the provision of essential and emergency surgery in children is patchy in resource-poor regions. This study aimed to determine the mortality risk for emergency abdominal paediatric surgery in low-income countries globally. Methods: Multicentre, international, prospective, cohort study. Self-selected surgical units performing emergency abdominal surgery submitted prespecified data for consecutive children aged <16 years during a 2-week period between July and December 2014. The United Nation's Human Development Index (HDI) was used to stratify countries. The main outcome measure was 30-day postoperative mortality, analysed by multilevel logistic regression. Results: This study included 1409 patients from 253 centres in 43 countries; 282 children were under two years of age. Among them, 265 (18.8%) were from low-HDI, 450 (31.9%) from middle-HDI and 694 (49.3%)

from high-HDI countries. The most common operations performed were appendectomy, small bowel resection, pyloromyotomy and correction of intussusception. After adjustment for patient and hospital risk factors, child mortality at 30 days was significantly higher in low-HDI (adjusted OR 7.14 (95% CI 2.52 to 20.23), p< 0.001) and middle-HDI (4.42 (1.44 to 13.56), p=0.009) countries compared with high-HDI countries, translating to 40 excess deaths per 1000 procedures performed. Conclusions: Adjusted mortality in children following emergency abdominal surgery may be as high as seven times greater in low-HDI and middle-HDI countries compared with high-HDI countries. Effective provision of essential emergency surgery should be a key priority for global child health agendas.

DISTRICT-LEVEL HOSPITAL TRAUMA CARE AUDIT FILTERS: DELPHI TECHNIQUE FOR DEFINING CONTEXT-APPROPRIATE INDICATORS FOR QUALITY IMPROVEMENT INITIATIVE EVALUATION IN DEVELOPING COUNTRIES

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Introduction—Prospective clinical audit of trauma care improves outcomes for the injured in high-income countries (HICs). However, equivalent, context-appropriate audit filters for use in Low- and Middle-Income Countries (LMIC) district-level hospitals have not been well established. We aimed to develop context-appropriate trauma care audit filters for district-level hospitals in Ghana and other LMICs more broadly.

Methods—Consensus on trauma care audit filters was built between twenty panellists using a Delphi technique with four anonymous, iterative surveys designed to elicit: i) trauma care processes to be measured; ii) important features of audit filters for the district-level hospital setting; and iii) potentially useful filters. Filters were ranked on a scale from 0 - 10 (10 being very useful). Consensus was measured with average percent majority opinion (APMO) cut-off rate. Target consensus was defined a priori as: a median rank of ≥ 9 for each filter and an APMO cut-off rate of ≥ 0.8 .

Results—Panelists agreed on trauma care processes to target (e.g. triage, phases of trauma assessment, early referral if needed) and specific features of filters for district-level hospital use (e.g. simplicity, unassuming resource capacity). APMO cut-off rate increased successively: Round 1 - 0.58; Round 2 - 0.66; Round 3 - 0.76; and Round 4 - 0.82. After Round 4, the target consensus on 22 trauma care and referral-specific filters was reached. Example filters include triage - vital signs are recorded within 15 minutes of arrival (must include breathing assessment, heart rate, blood pressure, oxygen saturation if available); circulation - a large-bore IV was placed within 15 minutes of patient arrival; referral - if a referral is activated, the referring clinician and receiving facility communicate by phone or radio prior to transfer.

Conclusion—This study proposes trauma care audit filters appropriate for LMIC district-level hospitals. Given the successes of similar filters in HICs

and obstetric care filters in LMICs, the collection and reporting of prospective trauma care audit filters may be an important step toward improving care for the injured at district-level hospitals in LMICs.

Keywords: trauma; quality improvement; global surgery; developing country; Ghana

DETERMINING THE WORLDWIDE EPIDEMIOLOGY OF SURGICAL SITE INFECTIONS AFTER GASTROINTESTINAL RESECTION SURGERY: PROTOCOL FOR A MULTICENTRE, INTERNATIONAL, PROSPECTIVE COHORT STUDY (GLOBALSURG 2)

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BMJ Open, 7(7), e012150, 2017. doi: 10.1136/bmjopen-2016-012150

Introduction Surgical site infection (SSI) is the most common complication following major gastrointestinal surgery, affecting between 25% and 40% of patients. The rate of SSI doubles from low-income to high-income settings, persisting after risk adjustment. The relative impact of antibiotic-resistant organisms and the effectiveness of antibiotic prophylaxis globally are unknown. This study aims to determine SSI rates following gastrointestinal surgery across worldwide hospital settings. Methods and analysis This multicentre, international, prospective cohort study will be undertaken by any hospital providing emergency or elective gastroenterological surgical services. Centres will collect observational data on consecutive patients undergoing emergency or elective gastrointestinal resection, cholecystectomy or appendicectomy during a 6-month period. The primary outcome is the incidence of SSI, with secondary outcomes describing the organisms causing SSIs, including their antibiotic susceptibility and the microbiological tests used to identify them. Ethics and dissemination This project will not affect clinical practice and has been classified as a clinical audit following a

research ethics review. The protocol will be disseminated through the international GlobalSurg network.

DECISION SUPPORT TOOLS IN MEDICINE: EVIDENCE-BASED MEDICINE APPROACH IN TAMALE TEACHING HOSPITAL

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PMJ 5(2), 74-78, 2016.

Objective: To determine whether laboratory results match the preliminary diagnosis using a model of malaria diagnosis by clinical staff at Tamale Teaching Hospital (TTH), Ghana. Methods: Data of outpatients diagnosed with malaria in 2012 were collected retrospectively from clinical notes. Data of the clinicians who provided the preliminary diagnoses were collected by self-reporting questionnaire. Statistical analyses were performed with Epi-Info and SPSS software. Results: A total of 344 patients were diagnosed with malaria in 2012, consisting of 186 females and 158 males. The age ranges between one month and 80 years. Forty-four clinicians responded to the questionnaire, consisting of 12 females and 32 males with mean ± SD age of 40.2±10.0 years. Respondents included consultants, medical officers, house officers, physician assistants, physician specialists and senior nurses, with mean ± SD years since qualification of 11.6±9.8 (range: 1-40 years). Nearly one-half (49%) of the clinicians reported not normally requesting laboratory investigations for suspected malaria cases, thus not following an evidencebased approach for preliminary diagnosis. Slightly over one and a half (51%) of the preliminary diagnoses of malaria in suspected cases were incorrect. However, statistical assessment of the clinician's preliminary diagnosis and the results from laboratory tests for malaria parasites showed a correlation (p=0.6548 at 95% CI). Conclusion: Practice of evidence-based medicine and the establishment of a technology-based healthcare system can lead to a decrease incorrect diagnoses and inappropriate health care management.

ASSESSING TRAUMA CARE CAPABILITIES OF THE HEALTH CENTERS IN NORTHERN GHANA

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Introduction: Traffic-related injury is a major and increasing cause of global mortality, especially in low- and middle-income countries (LMICs). However, trauma systems, personnel, resources, and infrastructure are frequently insufficient to meet the needs of the population in this at-risk population in LMICs. In addition, these resources are not uniformly distributed, coordinated, nor well described within most countries. Trauma care resources have not previously been characterized in the Northern Region of Ghana. Methods: We performed uniform site evaluations and interviews at 92 hospitals in Northern Ghana. Trauma systems, material and human resources were quantified. Equipment was characterized as available in the Emergency Department (ED), in the hospital only, or unavailable. Hospitals were categorized as primary, district, or referral. Results: Forty-two primary hospitals, 48 district hospitals, 3 regional hospitals, and 1 teaching hospital were surveyed. Over 95 % of hospitals reported having no training or systems for the care of injured patients. Substantial clinical equipment deficits were found at most primary hospitals. In over 90 % of these hospitals, the majority of circulation and monitoring, airway and breathing, and diagnostic imagining resources were not

available. Equipment was also frequently unavailable at district and regional hospitals. When available, these resources were infrequently present in the ED. Conclusions: Although resources may be unavoidably constrained, there are substantial opportunities to improve the systematic management of trauma care and improve the education of the medical providers regarding care of injured patients in the region studied.

UPPER GASTROINTESTINAL ENDOSCOPIC FINDINGS IN PATIENTS PRESENTING TO TAMALE TEACHING HOSPITAL, GHANA

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Background and objectives: Patients with dyspeptic symptoms are generally referred for upper gastrointestinal (UGI) endoscopy, which is the reference standard for diagnosis. The objective of the present study was to categorize the reasons for referral for UGI endoscopy and to evaluate the clinical findings of patients presented to the Tamale Teaching Hospital in Northern Ghana. Materials and methods: This study was a retrospective review of medical records from patients presented to the Tamale Teaching Hospital between October 2010 and October 2014 for UGI endoscopy indications. Data including clinical diagnosis, endoscopy findings, *Campylobacter-like* organism test results, and histopathology reports were collected and evaluated. Results: During the study period, a total of 2414 (1215 female, 1199 male) patients with a mean age of 40.2 ±16.6 years (range: 2–89 years) were referred for UGI endoscopy. The primary major complaints were epigastric pain

(58.9%), dyspepsia (18.4%), recurrent vomiting (8.9%), hematemesis (6.7%), and dysphagia (6.4%). Important endoscopic findings were gastric ulcer (25.6%), gastritis (22.1%), gastroesophageal reflux disease (17.3%), duodenal ulcer (10.3%), UGI bleeding (6.7%), gastric tumor (4.6%), and esophageal tumor (4.1%). Conclusion: The prevalence of severe UGI disease in this patient cohort suggests that additional centers are needed in northern Ghana for more timely detection.

Keywords: Endoscopy; Gastrointestinal diseases; Health resources

EFFECTIVENESS OF SURGICAL SKILLS TRAINING FOR SURGICAL WOUND DEBRIDEMENT USING ANIMAL TISSUE AS A SIMULATOR

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Background: To evaluate the effectiveness of surgical skills training for wound debridement using animal tissue as a simulator. Methods: House officers (HOs), Senior House Officers (SHOs) and Medical Officers (MOs) were taught basic surgical skills during a 3-day intensive course at the Tamale Teaching Hospital Basic Surgical Skills Training center. Wound debridement forms part of the training. Results of treatment of dirty wounds by participants were compared with those of a control group.

Results: Eighty-three (83) patients with dirty wounds were randomised for treatment by the study group and the control group. General characteristics of patients in both groups were comparable: the median age was 25.5 \pm 13.1SD; sex and age was similar between groups. Wound infection was found in 3(7.9%) patients treated by simulation-trained participants and 18 (40%) patients in the control group p<0.0001. Simulation-trained doctors prescribed antibiotics for less than five days in 33 (86.8%), as compared to 2 (4.4%) in the control group (p<0.001). Mean hospital stay in the study and control groups was 1.55 \pm 2.35 and 2.29 \pm 1.16 days, respectively (p=0.07).

Conclusion: Surgical skills training for wound debridement, using animal tissue as a simulator is effective. It is suggested that all HOs, SHOs and MOs should undergo similar training before undertaking any surgical rotation or before they start surgical residency. If incorporated at each level of the curriculum, simulation of surgical procedures using animal tissues would make a significant impact.

Key Words: simulation, wound debridement, training.

COMPARATIVE ASSESSMENT OF ENDOSCOPIC DIAGNOSIS AND EFFICACY OF ENDOSCOPIC HAEMOSTASIS FOR GASTROINTESTINAL ULCER BLEEDING IN PATIENTS WITH EXCESSIVE AND NORMAL BODY WEIGHT

Tabiri Stephen

Ukrainian Journal of Extreme Medicine, 4, 50-54, 2002.

The results of endoscopic diagnosis and treatment of 123 patients between the age of 24 and 72 years with bleeding from duodenal ulcer with normal and excess body weight were analysed. Postbulbar ulcer was diagnosed in 43.94% of patients with excess body weight and 11.63% with normal weight. Combined duodenal and stomach ulcers were found in 20.8% of patients with excess body weight. The combined ulcers were not found in patients with normal body weight. Rebleeding occurred in 29.41% and 25% after endoscopic haemostasis in excess body weight and normal body weight respectively.

Keywords: ulcer, stomach, duodenum, haemostasis, excess body weight, normal body weight gastrointestinal hemorrhage.

COMPARISON OF ULTRASTRUCTURAL PECULIARITIES OF DUODENAL CELLS IN PATIENTS WITH OVERWEIGHT AND NORMAL BODY WEIGHT SUFFERING FROM ACUTE BLEEDING

Tabiri Stephen

Medical Practice, 6, 5-8. 2002.

In patients with normal body weight, the sharp reduction of synthetic activity in both columnar epitheliocytes, and globet exocrinocytes are observed. The dystrophic phase expressed structural fragmentation of membranes. In patients with overweight dystrophic and destruction of submicroscopic structural columnar epitheliocytes and globet exocrinocytes are expressed more strongly. Many cells contain centers of destructive membranes of mitochondria and granular endoplasmic networks, indicating a predominance of digestive catabolism over anabolism.

DIAGNOSTIC PROBLEMS OF ACUTE APPENDICITIS

Tabiri Stephen, D.G. Dotsenko, E.G. Dotsenko

Medicine Today and Tomorrow, 3, 88-90, 2001.

Based on fifteen-year experience in the surgical treatment of acute appendicitis, differential diagnostics of acute appendicitis and diagnostic difficulties and mistakes have to be considered.

Keywords: acute appendicitis, differential diagnostic, surgical treatment.

PROGNOSIS OF RESULTS OF SURGICAL INTERVENTION IN DUODENAL ULCER BLEEDING IN NORMAL AND OVERWEIGHT PATIENTS

V. V. Boyko, **Tabiri Stephen**, V. I. Filipstov.

Ukrainian Journal of Extreme Medicine, 1, 39-42. 2002.

We carried out a clinical and diagnostic investigation of 157 patients (108 men and 49 women, average age 51, 47 \pm 1.9) with duodenal ulcer bleeding in normal weight (body mass index 21,54 \pm 1.9 kg/m2) and overweight (BMI32.60 \pm 1.13 kg/m2) was carried out. We used SSP statistical (SSP, New York, USA) for all data analysis. Linear regression analysis was used to determine the prognosis, and the results of surgical treatment. Predicted results were compared with the outcome of treatment in 75 patients with an accuracy of 86.6%

Keywords: duodenal ulcer, bleeding, prognosis.

RESPIRATORY FUNCTION AND ARTERIAL BLOOD GASES IN OVERWEIGHT PATIENTS WITH BLEEDING DUODENAL ULCER UNDERGOING SURGERY

Tabiri Stephen

Medicine Today and Tomorrow, 4, 117-120, 2002.

To compare ate external respiration function and blood acid-base equilibrium in patients with normal and excessive body mass and obesity undergoing surgical management of peptic ulcer bleeding. Data of external respiratory function and blood gases analysis of obese and non-obese subjects with duodenal ulcer bleeding were compared during the perioperative period. Excessive body mass was linked to decreased lungs' vital capacity, pH, increased pa $\rm CO_2$ and tachypnoea, and compensation of chronic respiratory acidosis. Our data support the contention that respiratory failure is the most typical complication in patients with obesity in the postoperative period.

Keywords: excessive body mass, acid-base equilibrium, functional external respiratory, peptic ulcer of duodenum haemorrhage.