

MAGPIES – Mapping Global Surgery

Introduction

Surgical volume is one of the Lancet Commission on Global Surgery indicators to measure access to surgery and to evaluate surgical care.¹ Previous studies have estimated the overall surgical volume (the number of surgical procedures) in each country (Holmer 2019)². However, case mix (i.e. the breakdown of procedures by patient age, surgical specialty, and urgency of surgery) is not known. Case mix information is needed to characterise and evaluate access to surgery to identify future priorities in the development and funding of surgical services around the world.

The aim of this study is to estimate the global surgery case mix with sufficient granularity to determine the number of operations completed in each country stratified by patient age, surgical specialty, and urgency of surgery.

Methods:

Study setting

This study will aggregate administrative data relating to surgical volume. All hospitals from all countries are eligible to take part. Local surgical and/or anaesthetic teams led by a resident or consultant will be invited to participate through the NIHR Global Surgery Unit network. For hospitals with 30 or fewer operating rooms, the team will have up to a maximum of 3 collaborators plus the hospital lead. For hospitals with more than 30 operating rooms, one more member can be added per each 10 operating rooms.

Each hospital team will count and aggregate the number of operations performed at their hospital site over a 14-day continuous period of their choice within the overall study window of 15th January 2024 to 28th February 2024.

Data collection will be stratified by age (adults *versus* children), five broad body regions (cardio-vascular-thoracic, general, musculoskeletal, and skin, head and neck and obstetrics), and urgency of surgery (elective, emergency).

Definitions

For the purposes of this study, we will use the following definitions:

Hospital: self-sufficient surgical facility that is under unified management. Provide total counts for all surgery performed in the hospital.

Surgery: operation performed by a surgeon in an operating theatre, except for minor procedures listed in the Appendix 2

Elective surgery: surgery that was planned prior to admission. Includes scheduled and expedited surgery (e.g. planned admission for cancer surgery 1 week after diagnosis).

Emergency surgery: surgery that was not planned prior to admission. Includes surgery on any unplanned admission and surgery for postoperative complications.

Adults: patients aged 18 years and above.

Children: patients aged under 18 years.

Each body region is defined in the data collection matrix (Appendix 1).

Inclusion criteria

Each hospital team is responsible to **count and aggregate ALL surgical activity** in their hospital during their chosen 14-day period. Both day case surgeries and inpatient surgeries are included. Eligible procedures performed with and without general anaesthetic are included. Endoscopic procedures (diagnostic or therapeutic) that are usually performed in an operating theatre by a surgeon are included.

Exclusion criteria

Minor procedures listed in Appendix 2 are excluded and should not be counted. Interventional radiology procedures are excluded. Endoscopic procedures that are usually performed outside of an operating theatre (e.g. in an endoscopy suite) or by a non-surgeon are excluded.

Data management

Data will be captured by local teams using theatre registers that record operating theatre activity (e.g. printed theatre logbooks or theatre management software), using a matrix stratifying the number of operations by age group, body region, and urgency (see Appendix 1). All eligible operations being performed on each site should be counted for the numbers collected.

Only aggregate totals will be collected; **this will be administrative data and no patient-level information will leave participating hospitals**. Only the local hospital teams will have access to any patient identifiable data; this will not be available to the study coordinators at the University of Birmingham.

Data will be collected and stored online through a secure server running the Research Electronic Data Capture (REDCap) web application, allowing safe anonymised data storage. The service is managed by the IT Services Department at the University of Birmingham, United Kingdom. The security of the study database system is governed by the policies of the University of Birmingham. Data management and data security will abide by the requirements of the General Data Protection Regulations (GDPR) and any subsequent amendments.

Data analysis

This data will be analysed using country income quintiles to estimate the case mix stratified by age, body regions, and urgency of surgery. Then we will use country-level data of surgical volume to calculate the number of procedures in each country according to age, body region and urgency of surgery.

We will collect the number of operations during a 14- consecutive day period between 15th January 2024 and 18th February 2024. Data collected will be stratified by age group (adults vs children), 5 main body regions (cardio-vascular-thoracic, general, ME and skin, head and neck and obstetrics) and urgency of surgery (elective vs emergency). This data will be combined with the surgical volume per country (Holmer 2019) and the data previously collected during GlobalSurg-CovidSurg Week and CovidSurg-3 study to estimate the global surgical case mix (Figure 1).

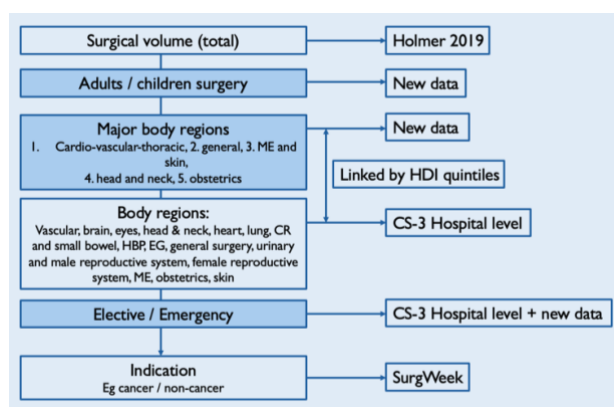


Figure 1: Data input to measure global surgery case-mix.

Ethics and approval of the study

This study does not change the usual care for patients and an application to the Ethics Commission in University of Birmingham to have the study approved was submitted. The risks associated with this study are very low considering that:

- No changes to patient care will be made as part of this study.
- No additional contact points will be required with patients.
- No patient identifiable data will be collected or submitted to the study coordinating team.
- Only aggregated administrative data will be collected and submitted to the study coordinating team.

Dissemination

The dissemination of study will be done using a stepwise approach to identify hospital leads able to lead the study. We will use the GECKO hospital leads network as the start point to disseminate this study, who can either assume hospital leadership or nominate someone. If no hospital lead identified after 2 weeks through this route, we will use HIPPO hospital leads network and apply the same principles. Hospitals where there is no hospital lead identified after 2 weeks, we will use COVIDSurg hospital lead network.

References

1. Meara JG, Greenberg SL. The Lancet Commission on Global Surgery Global surgery 2030: Evidence and solutions for achieving health, welfare and economic development. *Surgery*. May 2015;157(5):834-5. doi:10.1016/j.surg.2015.02.009
2. Holmer H, Bekele A, Hagander L, et al. Evaluating the collection, comparability and findings of six global surgery indicators. *Br J Surg*. Jan 2019;106(2):e138-e150. doi:10.1002/bjs.11061

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Appendix 1: Matrix

Each collaborator must collect data for all body regions in a single block of 14 consecutive days, representative of all surgeries that occurred in that period of time^{1, 2}.

Before you start data collection, please agree your participation with your Hospital Lead. This is to avoid overlap in data collection.

Dates you are collecting data for:

From ___ / ___ / 24 to ___ / ___ / 24

This should be a block of 14 consecutive days

	Operations in adults (age 18+) ³		Operations in children (age 0-17) ³	
	Elective ⁴	Emergency ⁵	Elective ⁴	Emergency ⁵
Head and neck				
Cardiovascularthoracic				
General surgery				
Musculo-skeletal and skin				
Obstetrics				
Total				

¹ **ALL** surgical activity relating to your selected body region should be captured, even if it is split between different surgical units in your hospital. Surgery is defined as an operation performed by a surgeon in an operating theatre, except for minor procedures listed in the Appendix 2.

² A hospital is a self-sufficient surgical facility that is under unified management. Provide total counts for all surgery performed in the hospital.

³ Provide a count of the number of **operations** rather than the number of patients. This means that if a particular patient has two operations they should be counted twice.

⁴ Elective surgery is that was **planned** prior to admission. Includes scheduled and expedited surgery (e.g. planned admission for cancer surgery 1 week after diagnosis).

⁵ Emergency surgery is defined as surgery that was **not planned** prior to admission. Includes surgery on any **unplanned** admission + surgery for postop complications.

Body regions definitions:

Head and neck: includes brain, eyes, ear, nose, mouth, salivary glands, tonsils, larynx, pharynx, maxillofacial surgery, and surgical tracheostomy.

Cardio-vascular-thoracic: includes heart, mediastinum, pericardium, lung, pleura, chest wall, aorta, arteries, and veins.

General surgery: includes oesophagus, stomach, bile ducts, gallbladder, liver, pancreas, spleen, colon, rectum, small bowel, fallopian tubes, ovaries, uterus, vagina, kidney, bladder, ureter, prostate, testicles, renal transplant, breast, endocrine, hernia, and miscellaneous emergency surgery.

Musculoskeletal and skin: Includes bones, joints, muscles, tendons, spinal surgery, burns surgery and flaps.

Obstetrics: includes C-section, evacuation of contents of uterus/ manual removal of placenta and repair of obstetric laceration (3/4th degree).

The data you collect should be submitted on REDCap.

Your Hospital Lead will provide a link to a survey where data should be submitted. You will not need a personal REDCap login.

Appendix 2: Inclusion criteria & list of excluded procedures

Example (not exhaustive list) included procedures	Excluded procedures
Head and neck	
<p>Brain procedures:</p> <ul style="list-style-type: none"> >Brain biopsy >Brain excision >Ventriculoperitoneal Shunt insertion >Craniectomy/Craniotomy >Drainage of spaces in the skull <p>Ophthalmology</p> <ul style="list-style-type: none"> >Procedures on the iris, retina, vitreous body, cornea, eyelid >Cataract surgery >Glaucoma surgery >Pterygium surgery >Strabismus surgery <p>ENT and maxillofacial</p> <ul style="list-style-type: none"> >Procedures on the cochlear, external auditory meatus, cochlear, inner ear, middle ear, external ear, and eardrum. >Excision of larynx >Orthognathic (jaw) surgery >Reduction/fixation of the mandible >Excision of bone of face >Drainage of extra/intra-oral abscesses >Orfacial cleft surgery >Radical and selective neck dissection >Nasendoscopy <u>with</u> intervention >Nasal fracture reduction >Endoscopic sinus surgery >Surgical arrest of bleeding from the internal nose >Excision of pharynx >Excision of submental, submandibular, and parotid gland. >Partial/total glossectomy >Tongue tie division (lingual frenectomy) >Tonsillectomy >Excision of adenoids >Surgical tracheostomy 	<ul style="list-style-type: none"> >Removal of foreign body from cornea >Implantation of tooth >Insertion of dental prosthesis >Orthodontic operations >Restoration of tooth >Extraction of tooth >Nasendoscopy (diagnostic or therapeutic) >Laryngoscopy (diagnostic or therapeutic) >Packing of cavity of the nose >Percutaneous tracheostomy
Cardio-vascular-thoracic:	
<p>Heart</p> <ul style="list-style-type: none"> >Valvular surgery >Atrial/ventricular septal defect repair >Coronary artery bypass graft >Heart transplant <p>Lung</p> <ul style="list-style-type: none"> >Resection of lung or chest wall >Resection of mediastinal mass >Lung transplantation <p>Aorta, arteries, and veins</p> <ul style="list-style-type: none"> >Aortic root/aorta surgery >Carotid enterectomy >Repair of arterial aneurysm >Varicose vein ligation and stripping >Formation of arterio-venous fistula >Embolectomy/thrombectomy >Arterial bypass 	<p>Heart</p> <ul style="list-style-type: none"> >Transluminal balloon angioplasty of coronary artery >Insertion of cardiac pacemaker >Percutaneous coronary intervention (PCI) <p>Lung</p> <ul style="list-style-type: none"> >Bronchoscopy (diagnostic or therapeutic) >Chest drain <p>Aorta, arteries, and veins</p> <ul style="list-style-type: none"> >Transluminal (endovascular) procedures on arteries (diagnostic or therapeutic), including with open cut down to the artery >Transluminal (endovascular) procedures on veins (diagnostic or therapeutic), such as endovenous laser treatment (EVLT) >Injection into varicose vein of leg >Insertion or removal of central venous catheter/line (CVC) >Insertion or removal of Hickmann line >Insertion or removal of dialysis catheter
General surgery	

<p>Oesophagus and stomach</p> <ul style="list-style-type: none"> >Nissen's fundoplication, Heller myotomy >Oesophagectomy, oesophagogastrrectomy >Gastrectomy >Primary / revision of anti-reflex operation >Perforated peptic ulcer repair <p>Hepatobiliary system</p> <ul style="list-style-type: none"> >Cholecystectomy >Liver resection >Liver transplantation >Distal pancreatectomy >Pancreaticoduodenectomy >Splenectomy <p>Colon, rectum, and small bowel</p> <ul style="list-style-type: none"> >Small bowel resection or bypass >Colorectal resection (excision, colectomy) >Stoma formation, refashioning, re-siting, and reversal >Repair of perforated duodenal ulcer >Perianal/pilonidal abscess incision and drainage <p>Female reproductive system</p> <ul style="list-style-type: none"> >Excision of the uterus (hysterectomy) >Uterus repair >Excision of vagina >Repair of vaginal prolapse >Ovarian detorsion >Oophorectomy +/- salpingectomy >Ovarian Cystectomy >Female sterilisation >Ablation/excision of endometrium: >Vulval procedures >Dilatation and curettage >Hysteroscopy + intervention/biopsy <p>Urinary and male reproductive systems</p> <ul style="list-style-type: none"> >Nephrectomy >Percutaneous nephrolithotomy >Transplantation of kidney >Cystectomy >Transurethral resection of bladder (TURBT) >Transurethral resection of prostate (TURP) >Female incontinence surgery >Circumcision >Male sterilisation >Hydrocele/varicocele surgery >Testicular exploration >Insertion of ureteric stent >Rigid cystoscopy under general anaesthesia 	<p>Oesophagus and stomach</p> <ul style="list-style-type: none"> >Oesophago-gastro-duodenoscopy [OGD] (diagnostic or therapeutic) <p>Hepatobiliary system</p> <ul style="list-style-type: none"> >Endoscopic retrograde cholangiopancreatography [ERCP] (diagnostic or therapeutic) >Liver biopsy <p>Colon, rectum, and small bowel</p> <ul style="list-style-type: none"> >Colonoscopy (diagnostic or therapeutic) >Flexible sigmoidoscopy (diagnostic or therapeutic) >Proctoscopy (diagnostic or therapeutic) <p>Female reproductive system</p> <ul style="list-style-type: none"> >Cervical biopsy >Colposcopy (diagnostic or therapeutic) <p>Urinary and male reproductive systems</p> <ul style="list-style-type: none"> >Bladder biopsy >Extracorporeal shock wave lithotripsy (ESWL) >Flexible cystoscopy (diagnostic) >Percutaneous nephrostomy
<p>Endocrine</p> <ul style="list-style-type: none"> >Adrenalectomy >Parathyroidectomy >Pituitary gland excision >Thyroidectomy <p>Breast</p> <ul style="list-style-type: none"> >Mastectomy >Lumpectomy >Mammoplasty >Procedures on axillary nodes <p>Hernia</p> <ul style="list-style-type: none"> >Femoral, inguinal, incisional, umbilical hernia repair >Ventral, Spigellian, epigastric hernia repair <p>Other</p> <ul style="list-style-type: none"> >Excision of retroperitoneal sarcoma >Multivisceral resection <p>Emergency surgery</p> <ul style="list-style-type: none"> >Trauma laparotomy >Abdominal exploration and washout >Appendicectomy (open or laparoscopy) >Adhesiolysis (open or laparoscopic) >Diagnostic laparoscopy +/- washout >Diagnostic laparotomy +/- washout 	<ul style="list-style-type: none"> >Ascitic drain (drainage of the peritoneal cavity) >Breast biopsy >Endoscopic ultrasound >Laparoscopic ultrasound >Vacuum dressing

Musculoskeletal and skin: Includes and spinal surgery	
<p>Bones, joints, muscles, and tendons</p> <ul style="list-style-type: none"> >Amputation of foot, leg, toe >Ligament repair >Arthroscopy of joint >Limb fracture surgery >Debridement and irrigation joint >Fasciotomy >Joint replacement >Muscle/tendon repair >Carpal tunnel release >Nailbed surgery <p>Spinal</p> <ul style="list-style-type: none"> >Cranial nerve, peripheral nerve, sympathetic nerve operation >Vertebral procedures >Decompression/excision of intervertebral disc >Laminectomy <p>Burns surgery and flaps</p> <ul style="list-style-type: none"> >Excision of benign and malignant skin lesion >Excision of sebaceous cyst >Repair of skin laceration >Abdominoplasty >Burns debridement, excision, dressing and reconstruction. >Flap (local and free) or skin graft 	<p>Bones, joints, muscles, and tendons</p> <ul style="list-style-type: none"> >Bone biopsy >Injection into the joint >Muscle biopsy <p>Spinal</p> <ul style="list-style-type: none"> >Lumbar (spinal) puncture >Therapeutic epidural injection <p>Burns surgery and flaps</p> <ul style="list-style-type: none"> >Skin biopsy (including shave biopsy of skin)
Obstetrics	
<ul style="list-style-type: none"> >Caesarean section >Evacuation of contents of uterus/ manual removal of placenta >Repair of obstetric laceration (3/4th degree) 	<ul style="list-style-type: none"> >Any vaginal delivery (normal delivery, breech delivery, forceps delivery, vacuum delivery) >Surgical termination of pregnancy