Determining the Minimum Dataset for Surgical Patients in Africa: A Delphi Study

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Abstract

Background

It is often difficult for clinicians in African low- and middle-income countries middle-income countries to access useful aggregated data to identify areas for quality improvement. The aim of this Delphi study was to develop a standardised perioperative dataset for use in a registry.

Methods

A Delphi method was followed to achieve consensus on the data points to include in a minimum perioperative dataset. The study consisted of two electronic surveys, followed by an online discussion and a final electronic survey (four Rounds).

Results

Forty-one members of the African Perioperative Research Group participated in the process. Forty data points were deemed important and feasible to include in a minimum dataset for electronic capturing during the perioperative workflow by clinicians. A smaller dataset consisting of eight variables to define risk-adjusted perioperative mortality rate was also described.

Conclusions

The minimum perioperative dataset can be used in a collaborative effort to establish a resource accessible to African clinicians in improving quality of care.

Introduction

Tracking and interpreting patient outcomes is an indispensable component of clinical audit, and quality improvement. Perioperative data can also be used to define surgical indicators in planning health system strengthening and to risk stratify patients and decide on the most appropriate clinical pathway. However, it is often difficult for clinicians in low- and middle-income countries (LMICs) to access quality aggregated data to identify areas for quality improvement. In African LMICs, clinical data are commonly available only from paper-based medical records, and a strategy to routinely collect data using a standardised dataset is lacking. Furthermore, there remains a lack of digital health tools for clinicians to use and contribute data in African LMICs. These issues significantly disempower clinicians in understanding factors determining quality of care, appropriate clinical risk management and advocacy efforts with decision-makers [1].

The results of the African Surgical Outcomes Study (ASOS) suggest that the quality and safety of perioperative care in LMICs is poor in comparison with high-income countries. Surgical mortality is twice that of high-income countries [2], and fiftyfold higher for caesarean section [3].

The Lancet Commission on Global Surgery has proposed global indicators to measure access to safe, affordable surgical care [4], which were recently updated [5]. Perioperative clinical datasets should include data points to define global surgery indicators, such as Perioperative Mortality Rate (POMR) and Surgical Volume, from clinical data aggregated at a population-level. These data are vital for surgical systems strengthening, and perioperative mortality is a crude indication of quality of care.

Preoperative risk stratification assists in directing care and resources to those patients at highest risk for poor postoperative outcome [6, 7]. The dataset required to develop risk prediction tools can be used to guide the inclusion of data points in a registry. The ASOS Surgical Risk Calculator was developed from the ASOS cohort, and used in the African Surgical Outcomes-2 Trial [8, 9]. The predictors included in the ASOS Surgical Risk Calculator are similar to parsimonious clinical prediction models such as the Surgical Outcome Risk Tool (SORT) [10], but the paucity of data currently available for risk stratification tool development precludes comparison with broadly applicable prediction tools such as the Universal ACS NSQIP Surgical Risk Calculator [11].

The African Perioperative Research Group (APORG) is a collaborative responsible for the successful execution of multicentre studies and trials in African countries [2, 9, 12]. The Group previously determined the top ten research priorities for Africa [13], which included the "Establishment of a minimal dataset surgical registry" for Africa. The rationale for this priority was to benchmark surgical outcomes across hospitals in Africa. Tracking outcomes can assess the success of intervention implementation strategies to improve quality, while ensuring resources are not wasted on futile projects.

The aim of this study was to develop a standardised (number and definition of data points) perioperative dataset to be used in a registry that facilitates risk stratification, quality assurance and improvement initiatives, clinical trials, and implementation research for perioperative outcomes in Africa.

Material and methods

Ethical approval was granted from the Human Research Ethics Committee, University of Cape Town (REF 490/2020). A Delphi method approach was used—an accepted method for achieving convergence of opinions concerning knowledge solicited from experts, that has been adopted for priority setting in medicine [14]. The study was conducted between November 2020 and July 2021. An open email invitation was sent to all national and hospital leaders who have participated in the ASOS studies, inviting them to participate. The invitation was extended to prominent Global Surgery advocates. All participants provided written informed consent prior to participating in this study. Participation was voluntary. The surveys used a REDCap [15] tool designed by Safe Surgery South Africa [16]. The surveys were translated into French and participants had the choice of answering the surveys in English or French.

In the first round, participants were asked to score the importance of suggested (HK) data points on a 9-point Likert scale (where 1 was least important and 9 was most important). The suggested dataset was developed based on data collected during the African Surgical Outcomes Study[2] and the maternal- and neonatal outcomes sub-study of ASOS [3]. Several quality process indicators were also added, based on recommendations in a systematic review of perioperative quality indicators [17]. The use of these selected indicators is supported by level 1a or 1b evidence. The data points were presented in the order of the perioperative workflow, i.e. preoperative, intraoperative and postoperative. The study information, consent document and suggested data points are included as Supplementary Material 1. Participants were encouraged to submit other potential data points for inclusion in the minimum dataset, comment on each data point, and upload supporting documents (i.e. literature) to substantiate suggestions.

The responses from participants were collated, and the median (IQR) score for each data point was determined. Data from incomplete surveys were included. The guidance for scoring was the following: Data points that had: (i) a median score between 1 and 3 were considered unimportant and were excluded from the dataset for further rounds of the Delphi, (ii) a median score between 4 and 6 were considered potentially important and may be included in the dataset, and (iii) a median score between 7 and 9 were considered important and were included in the dataset.

In the second round, data points were presented to participants in rank order based on the median (IQR) score from Round 1. Additionally, definitions of data points were updated, where indicated, based on the comments from participants in Round 1. We (HK & BB) provided notes explaining any updating of definitions of the data points. Quality indicators were still indicated as such. We indicated when a data point was conditional, i.e. that it depended on the inclusion of another data point, and when a data point was calculated from other data points, where appropriate. Lastly, we indicated when a data point would be subject to an implementation standard, meaning that its use and definition would be determined by the end-users of the dataset, and by the objectives for the use of the data point.

The use of conditional and inferential (i.e. based on the results of other data points) data points to potentially decrease the apparent size of the dataset, was communicated to participants.

During Round 2, participants were asked to consider how practical or feasible inclusion of each data point would be; that is how easy, practical and convenient the data points would be to capture (by clinicians or trained data capturers), manage and analyse. Further, participants were asked to consider how the data point would be used to identify areas for quality improvement. Participants were asked to again score the suggested data points for the minimum dataset using the same 9-point Likert scale. Participants were again requested to comment on any or all aspects (importance, feasibility, evidence-base, or any other aspect) of inclusion of each data point in a minimum perioperative dataset. Participants were encouraged not to discuss their submissions with other colleagues to minimise bias.

In preparation for Round 3, a spreadsheet was drafted with changes to data points made based on comments from participants in Round 1 and 2 highlighted in red font. Data points with similar definitions and questionable feasibility, based on comments from the first two rounds, quality indicators considered not feasible or inappropriate in our setting, and all postoperative quality indicators were removed. (Postoperative process quality indicators were considered to add a significant burden of data collection, and only simple outcome measures were included). References were provided to substantiate changes in definitions of data points [18,19,20,21,22].

In Round 3, participants discussed the proposed dataset, the changes and proposed omissions, via an online, interactive session as part of the consensus process. All the data points in the minimum dataset should be feasible to collect in every surgical patient by a clinician (an anaesthetic team member for pre- and intraoperative data points, and a surgical team member for postoperative data points). The Round 3 discussion focussed on minimising the dataset to ensure feasibility of data collection on implementation.

Following the Round 3 meeting discussion, a recommended minimum dataset for Africa was presented to all participants in the final round, with additional data points to be included in an extended (or what was referred to as a “core”) dataset. Most participants (75%) had to agree on exclusion of data points from the minimum dataset (and for inclusion in an extended dataset). The participants also decided to present a smaller “basic” dataset from the minimum dataset.

This e-survey is presented according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines (Supplementary Material 2).

Results

Round 1

A total number of 75 email invitations to Round 1 were sent. A total of 35 participants from 24 African countries responded in Round 1, of which 30 surveys were complete. Of the 121 data points in the suggested dataset, all except one (“Preoperative B-type Natriuretic Peptide for cardiovascular risk stratification done,” which scored a median of 6) scored a median of 7 or higher. The result of the first round of this study was that no data points were excluded from a proposed minimum clinical perioperative dataset.

Round 2

The 35 respondents to Round 1 were invited to Round 2. Ten data points were removed for Round 2 as they are not required for an anonymised data registry, i.e. data points regarding identifiers for patients, providers and hospitals; contact details and consent.

A total of 27 participants responded in Round 2, of which 22 surveys were complete. Of the 111 variables in the suggested dataset in Round 2, all except one ("Ready for surgical field preparation time," which scored a median of 6) scored a median of 7 or higher. Therefore, based on the scoring guidance, we were unable to exclude any of the variables for review in Round 3.

Round 3

We decided to deviate from the protocol (protocol deviation 1 of 2) and change the format of the third round to a live online discussion. This decision was made on the basis that (1) none of the variables were eligible for exclusion in both Rounds 1 and 2, and (2) it was possible that there was not a common understanding among clinicians that the minimum dataset needed to be feasible for clinicians to capture the data. A total of 11 participants participated in the online live discussion. In Round 3, the consensus was that there were still too many data points for a minimum dataset. Therefore, it was suggested that some of the data points be removed from the minimum dataset and added to an extended dataset, i.e. these data points would not be part of the mandatory data points for the minimum dataset. The recommendation was that 13 additional data points be included in the extended dataset. The data points in the extended dataset can be added to the minimum dataset at an institutional level to capture data necessary for quality improvement at the site. Quality indicators retained were five pre- and intraoperative quality indicators, which may influence the most common severe complications after surgery, i.e. infectious complications and bleeding. Furthermore, most participants suggested that three data points be excluded from the minimum dataset—Body Mass Index, Most Senior Anaesthetist present in the operating room, and Intraoperative Normothermia maintained (quality indicator).

Round 4

To confirm the proposals made during the Round 3 discussion, a survey was distributed to the whole participant group as the fourth and final round of the consensus process (protocol deviation 2 of 2). A total of 30 participants responded in Round 4. The final consensus still included 40 data points, based on the majority (75% and more of participants) opinion in Round 4. Changes made to the original proposed dataset during the Delphi consensus process were indicated in red font. The minimum perioperative dataset, and the smaller "basic" dataset are presented in Tables 1 and 2. The final minimum perioperative dataset has been published under a Creative Commons Licence (CC BY 4.0) 10.6084/ m9.figshare.19174751.

Table 1 Minimum perioperative dataset

Pre- and Intraoperative data points		
Short description	Definition	Round 2 score: Median (IQR)
Age	Age in years, months, and days	9.0 (2.0)
Sex	Options: Male, Female, Other	9.0 (2.0)
ASA Physical Status classification	Options: I, II, III, IV, V	9.0 (0.0)
Co-morbid disease	Checkbox (multiple answers possible): Co-morbid disease: Coronary artery disease; Congestive heart failure; Diabetes mellitus; Metastatic cancer; Hypertension; Stroke or Transient ischaemic attack; HIV positive/AIDS; Chronic renal disease; Other	9.0 (2.0)
Haemoglobin g/dL	Provide preoperative haemoglobin value in g/dL, or indicate 'Not done'	9.0 (2.0)
Maternal conditions	Change to checkbox (multiple answers possible): Maternal conditions: Pre-eclampsia; Eclampsia; Cardiac disease; Placenta praevia; Placenta abruption; Ruptured uterus; Sepsis; Antepartum haemorrhage; Other	9.0 (1.0)
Parity	Parity, numerical	7.0 (3.0)
Gravidity	Gravidity, numerical	8.0 (2.0)
Foetal distress present	Options: Yes; No	9.0 (2.0)
Gestational age	Gestational age in weeks	9.0 (2.0)
Number of foetuses	Options: One; Two; Three or more	9.0 (2.0)
Most senior surgeon	The most senior surgeon in the operating room. Options: Specialist physician; Non-specialist physician; Non-physician	8.0 (2.0)
WHO Safe Surgery Checklist	WHO Safe Surgery Checklist was performed and documented. Options: Yes; No	Not scored
Prophylactic antibiotics	Prophylactic antibiotics administered within 60 min around start of surgery. Options: Yes; No; Not required	9.0 (2.25)
VTE prophylaxis	Pharmacological venous thromboembolism prophylaxis prescribed within 24 h prior to surgery to 24 h after surgery. Options: Yes; No	9.0 (2.0)
Preoperative fasting	Adequate preoperative fasting: e.g. clear fluids up to 2 h prior to surgery, solids up to 6 h prior to surgery. Options: Yes; No—prolonged fasting with no clear fluids; No—no fasting	9.0 (2.0)
Surgical field preparation	Surgical field preparation done according to local standards. Yes; No	9.0 (3.0)
Urgency of surgery	IMMEDIATE—Immediate life, limb or organ-saving intervention—resuscitation simultaneous with intervention. Normally within minutes of decision to operate. URGENT—Intervention for acute onset or clinical deterioration of potentially life-threatening conditions, those conditions that may threaten the survival of limb or organ, fixation of many fractures or relief of pain or other distressing symptoms. Normally within hours of decision to operate. EXPEDITED—Patient requiring early treatment where the condition is not an immediate threat to life, limb or organ survival. Normally within days of decision to operate. ELECTIVE—Surgery which could be postponed or not done at all without danger to the patient. Intervention planned or booked in advance of routine admission to hospital. Timing to suit patient, hospital and staff	9.0 (1.0)
Severity of surgery	Options: Minor surgical procedure (Would include procedures lasting less than 30 min which would often involve extremities or body surface or brief diagnostic and therapeutic procedures); Intermediate surgical procedure (More prolonged or complex procedures that may pose the risk of significant complications or tissue injury); *Major* surgical procedure (Clinical estimation of severity of surgical onslaught or risk associated with surgical procedure—based on expected long operative duration, organ ischaemia, significant blood loss and high vasopressor use during procedure; expected postoperative stress response; and increased postoperative morbidity and mortality)	9.0 (1.0)
Primary indication for surgery	Primary indication for surgery (single answer): -Infective—Malignancy—Non-communicable disease—Injury—Caesarean section	9.0 (1.0)
Surgical diagnosis	Single ICD-10/ICD-11 code to indicate primary surgical diagnosis as confirmed intra-operatively	9.0 (1.0)
Surgical procedure category (select single most appropriate)	Surgical procedure category (select single most appropriate): Orthopaedic (Replacement); Orthopaedic (Other); Spinal Surgery; Neurosurgery; Breast; Obstetrics; Gynaecology; Upper gastro-intestinal; Lower gastro-intestinal; Hepato-biliary; Urology & Kidney; ENT; Maxillo-facial/Dental; Eye; Plastics/Cutaneous; Vascular; Cardiac; Thoracic (lung & other); Thoracic (gut); Head and neck (multidisciplinary)	9.0 (2.0)
Procedure name (placeholder)	Surgical procedure name with ICHI classification	8.5 (3.0)
Preoperative length of stay	Preoperative length of hospital stay in calendar days and hours. Calculated from 'Date and time of hospital admission' to 'Date and time of surgical procedure'	

Table 1 continued

Pre- and Intraoperative data points		
Short description	Definition	Round 2 score: Median (IQR)
Duration of surgery	Calculated variable, in minutes: Calculated from 'Time of surgical incision' and 'Time of surgical dressing completed'	9.0 (3.0)
Anaesthetic plan	Change to checkbox (multiple answers possible): General; Regional; Spinal; Epidural; TIVA/TCI; Sedation; Monitored Anaesthesia Care	9.0 (1.0)
Monitoring	Intraoperative monitoring (multiple answers possible): Electrocardiography; Noninvasive blood pressure; Pulse oximetry; End-tidal carbon dioxide; Temperature; Neuromuscular transmission; BIS/Entropy; Near infrared spectroscopy; Cardiac Output; Other	9.0 (2.5)
Intraoperative complications	Intraoperative complications—Options: Yes/No for Airway; Bleeding; Cardiac; Other—Grade: Intra-operative events classification: **Grade 0** No deviation from the ideal intraoperative course; **Grade I** Any deviation from the ideal intraoperative course—Without the need for any additional treatment or intervention—Patient with no or mild symptoms *Examples—Airway: reversible laryngospasm Bleeding: bleeding above average from small calibre vessel, self-limiting or definitively manageable without additional treatment than routine coagulation—Injury: minimal serosal intestinal lesion, not requiring any additional treatment—Cautery: small burn of the skin, no treatment necessary—Arrhythmia: arrhythmia (e.g. extrasystoles) without relevance* **Grade II** Any deviation from the ideal intraoperative course—With the need for any additional minor treatment or intervention—Patient with moderate symptoms, not life threatening, and not leading to permanent disability. *Examples—Airway: negative pressure pulmonary oedema, resolved on treatment Bleeding: bleeding from medium calibre artery or vein, ligation; use of tranexamic acid—Injury: non-transmural intestinal lesion requiring suture(s)—Cautery: moderate burn requiring noninvasive wound care—Arrhythmia: arrhythmia requiring administration of antiarrhythmic drug, no haemodynamic effect* **Grade III** Any deviation from the ideal intraoperative course—With the need for any additional moderate treatment or intervention—Patient with severe symptoms, potentially life threatening or potentially leading to permanent disability *Examples—Airway: unexpected difficult intubation or loss of airway control, with resultant airway trauma/surgical airway Bleeding: bleeding from large calibre artery or vein with transient haemodynamic instability, ligation or suture; blood transfusion—Injury: transmural intestinal lesion requiring segmental resection—Cautery: severe burn requiring surgical debridement—Arrhythmia: arrhythmia requiring administration of antiarrhythmic drug, transient haemodynamic effect* **Grade IV** Any deviation from the ideal intraoperative course—With the need for any additional major and urgent treatment or intervention—Patient with life-threatening symptoms or leading to permanent disability *Examples—Airway: Hypoxia due to loss of airway control, requiring mechanical ventilation Bleeding: life-threatening bleeding with splenectomy; massive blood transfusion; stay at intensive care unit—Injury: injury of central artery or vein requiring extended intestinal resection—Cautery: life-threatening burn injury by cautery leading to fire requiring intensive care treatment—Arrhythmia: arrhythmia requiring electroconversion, defibrillation, or admission to intensive care* **Grade V** Any deviation from the ideal intraoperative course with intraoperative death of the patient	9.0 (2.0)
Red blood cell transfusion (total volume)	Intra-operative packed red blood cell transfusion: number of standard units (approximately 350 ml per unit) OR total volume in millilitre	8.0 (2.0)
Neonatal CPR following delivery	Neonatal CPR: chest compressions following delivery OR respiratory support with/without intubation, before transfer out of operating room	9.0 (2.0)
Blood loss during surgery	Estimated blood loss during surgery in millilitre	9.0 (2.0)
Estimated risk of death	ASOS Risk Calculator score, numerical	8.0 (2.0)

Postoperative data points		
Short description	Definition	Round 2 score: Median (IQR)
In-hospital mortality	Alive at discharge from hospital	9.0 (1.0)
Postoperative length of stay	Postoperative length of hospital stay in calendar days. Calculated from 'Date of surgical procedure' to 'Date of discharge from hospital'	9.0 (2.0)
Destination after surgery	Postoperative discharge destination from recovery room or post-anaesthesia care unit. Options: Home; Other facility e.g. stepdown; Surgical ward; Primary (level 1) ICU; Secondary (level 2) ICU; Tertiary (level 3) ICU	9.0 (2.0)
Patient needed higher postoperative level of care	Level of care where patient admitted postoperatively is sufficient for patient needs. Options: Yes; No. If No, choose one or more of the following reasons: No beds available; No staff available; Other reason	

Unplanned critical care admission	Unplanned critical care admission: any admission to ICU during hospital stay other than planned transfer from OR/PACU. Options: Yes; No	9.0 (2.0)
Critical care length of stay	Change to matrix of data points on duration of postoperative planned and unplanned level of care: Duration of Primary (level 1) ICU stay in calendar days; Duration of Secondary (level 2) ICU stay in calendar days; Duration of Tertiary (level 3) ICU stay in calendar days; Duration of invasive mechanical ventilation in hours	9.0 (3.25)
Re-operation for surgical complication	Repeat (redo) or follow up (new) procedure for a surgical complication during hospital stay (Grade III Clavien-Dindo) Options: Yes; No	
Postoperative complications	On discharge from hospital, complete checklist (multiple answers possible) for adapted Postoperative Morbidity Survey—morbidity developed during *any 24 h period* of postoperative hospital admission: **Pulmonary**—Has the patient developed a new requirement for oxygen or respiratory support during postoperative admission? *Clavien Dindo Grade options: I; II; III; IV; V* **Infectious**—Did the patient receive antibiotics and/or had a temperature of > 38 degrees C during postoperative admission? *Clavien Dindo Grade options: I; II; III; IV; V* **Renal**—Presence of oliguria < 500 mL/24 h or < 0.5 ml/kg/hr; increased serum creatinine (> 30% from preoperative level) *Clavien Dindo Grade options: I; II; III; IV; V* **Gastro-intestinal**—Unable to tolerate an enteral diet for any reason including nausea, vomiting, and abdominal distension *Clavien Dindo Grade options: I; II; III; IV; V* **Cardiovascular**—Diagnostic tests or therapy for any of the following: new myocardial infarction or ischaemia, hypotension (requiring fluid therapy > 200 mL/hr or pharmacological therapy), atrial or ventricular arrhythmias, cardiogenic pulmonary oedema, thrombotic event (requiring anticoagulation) *Clavien Dindo Grade options: I; II; III; IV; V* **Neurological**—New focal neurological deficit, confusion, delirium, or coma. *Clavien Dindo Grade options: I; II; III; IV; V* **Hematological**—Requirement for any of the following: packed erythrocytes, platelets, fresh-frozen plasma, or cryoprecipitate. *Clavien Dindo Grade options: I; II; III; IV; V* **Wound**—Wound dehiscence requiring surgical exploration or drainage of pus from the operation wound with or without isolation of organisms. *Clavien Dindo Grade options: I; II; III; IV; V* **Pain**—New postoperative pain significant enough to require parenteral opioids or regional analgesia. *Clavien Dindo Grade options: I; II; III; IV; V*	9.0 (2.0)

IQR—Interquartile range, *ASA*—American Society of Anaesthesiologists, *WHO*—World Health Organisation, *VTE*—Venous thromboembolism, *ENT*—Ear, Nose & Throat (surgery), *ICD*—International Classification of Diseases, *ICHI*—International classification for Health Interventions, *TIVA/TCI*—Total Intravenous Anaesthesia/Target Controlled Infusion, *ICU*—Intensive Care Unit, *OR*—Operating room, *PACU*—Post-anaesthesia Care Unit

Table 2 Dataset to define risk-adjusted Perioperative Mortality Rate (POMR)

Short description	Definition
Age	Age in years, months, and days
ASA Physical Status classification	Options: I, II, III, IV, V
Urgency of surgery	IMMEDIATE—Immediate life, limb or organ-saving intervention—resuscitation simultaneous with intervention. Normally within minutes of decision to operate. URGENT—Intervention for acute onset or clinical deterioration of potentially life-threatening conditions, for those conditions that may threaten the survival of limb or organ, for fixation of many fractures and for relief of pain or other distressing symptoms. Normally within hours of decision to operate. EXPEDITED—Patient requiring early treatment where the condition is not an immediate threat to life, limb or organ survival. Normally within days of decision to operate. ELECTIVE—Surgery which could be postponed or not done at all without danger to the patient. Intervention planned or booked in advance of routine admission to hospital. Timing to suit patient, hospital and staff
Severity of surgery	Options: Minor surgical procedure (Would include procedures lasting less than 30 min which would often involve extremities or body surface or brief diagnostic and therapeutic procedures); Intermediate surgical procedure (More prolonged or complex procedures that may pose the risk of significant complications or tissue injury); *Major* surgical procedure (Clinical estimation of severity of surgical onslaught or risk associated with surgical procedure—based on expected long operative duration, organ ischaemia, significant blood loss and high vasopressor use during procedure; expected postoperative stress response; and increased postoperative morbidity and mortality)
Surgical procedure category (select single most appropriate)	Surgical procedure category (select single most appropriate): Orthopaedic (Replacement); Orthopaedic (Other); Spinal Surgery; Neurosurgery; Breast; Obstetrics; Gynaecology; Upper gastro-intestinal; Lower gastro-intestinal; Hepato-biliary; Urology & Kidney; ENT; Maxillo-facial/Dental; Eye; Plastics/Cutaneous; Vascular; Cardiac; Thoracic (lung and other); Thoracic (gut); Head and neck (multidisciplinary)
Procedure name (placeholder)	Surgical procedure name with ICHI classification
In-hospital mortality	Alive at discharge from hospital
Postoperative length of stay	Postoperative length of hospital stay in calendar days. Calculated from 'Date of surgical procedure' to 'Date of discharge from hospital'

ASA—American Society of Anaesthesiologists, *ENT*—Ear, Nose and Throat (surgery), *ICHI*—International classification for Health Interventions

Forty-one respondents participated to any or all of the four Rounds. The number of participants during each round, and any or all rounds in the total, is indicated in Table 3, according to discipline.

Table 3 Number of participants per discipline

Discipline	Round 1	Round 2	Round 3	Round 4	Total number per discipline
Anaesthetist	19	14	4	16	22
Surgeon	13	10	4	11	15
Obstetrician and gynaecologist	1	1	2	1	2
Other, e.g. public health specialist	1	1	1	2	2
Total	34	26	11	30	41

Discussion

Principal findings

Using a Delphi consensus process, the authors defined a minimum perioperative patient-level dataset consisting of 32 pre- and intra-operative data points (including six process quality indicators) and eight postoperative data points that are feasible for clinicians to collect during the clinical workflow using digital applications. The smaller 'basic" dataset consists of eight data points.

Interpretation

The minimum dataset can be used as a clinical patient-level perioperative registry [23] for risk-adjusted outcomes in Africa [8] and possibly other LMICs. The data points for an anonymised data repository can be extracted from a local (hospital-based or discipline-specific) private data repository that contains identifiers for patients and providers, to ensure the quality (completeness, uniqueness, timeliness, validity, accuracy and consistency) of data. This requires the local repository to adhere to interoperability standards, and use a national master patient index and healthcare provider database. The use of a patient registry by clinicians allows for the identification of areas for quality improvement at a team (micro) or hospital (meso) level [24], and provides evidence supporting advocacy initiatives at a national level.

Although significant work is still needed at a country level to promote the use of digital tools to capture patient-level data and integration of such tools within the national digital health architecture, the work reported here is a first step towards establishing a perioperative registry that adheres to FAIR (findable, accessible, interoperable, reusable) principles [25].

In LMICs, the lack of data analytical resources may impact the ability of clinicians to use data in registries to its full potential. Sharing data with adequate safeguards in place, and pooling analytical resources, may enable clinicians generating the data to implement and track quality improvement initiatives across Africa to address the inequality in healthcare on the Continent.

Limitations

The rigour of this Delphi study may be challenged regarding reliability and validity [26]. However, we have tried to address these issues as far as possible within the group of participants.

The definition of a "minimum perioperative dataset' and its envisaged use were extensively discussed with Round 3 participants, but not with the whole group of participants. All participants may not have been clear on the application of the knowledge to be gained during the consensus process. The limited number of participants in Round 3 may have biased the study in the sense that the full group of participants could not participate in the discussion on minimising the dataset. The entire group was, however, invited to confirm the suggestions of Round 3 participants in the final round.

A data point to describe the training and/or experience of the anaesthesia provider was not included in the dataset. Secondary analysis of the African Surgical Outcomes Study (ASOS) demonstrated that anaesthesia provider training may impact on patient outcome after procedural sedation [27]. It is therefore reasonable to recommend the inclusion of such a data point on implementation of the dataset, despite the consensus reached in this study.

The dataset does not include variables which may be important in certain surgical populations, e.g. paediatric patients. The implementation of the dataset in a paediatric population was not explored further. The African Paediatric Surgical Outcomes Study (ASOS-Paeds) is in progress and should enable evidence-based updating of the minimum dataset for paediatric-specific data points.

To ensure application of the dataset across information systems, the clinical terminology needs to be mapped to digital health standards. This is particularly relevant for data points where no global terminology standard is currently in use, e.g. surgical procedure definitions. Future modification of data points should be considered, e.g. the use of the GlobalSurg Collaborative[28] or the International Classification for Health Interventions definitions. It is essential that the dataset definitions and standards are periodically updated according to international developments, both from a clinical [29] and digital health perspective.

A smaller "basic" dataset to define risk-adjusted peri-operative mortality rate (POMR) may be feasibly collected in Routine Health Information Systems (RHIS). POMR and surgical volume are indicators recommended to guide development of National Surgical Obstetric and Anaesthesia Plans [4].

Future research

There is a commitment by the African Perioperative Research Group (APORG) to establish a prospective perioperative registry in Africa. It needs to be piloted to confirm feasibility of complete data collection on every surgical patient at a surgical facility. Significant clinical community engagement, with clear messages regarding the proposed use of the data at all levels, is required. Country-level engagement with a network of data users may assist in fund-raising and sustainability of a registry initiative on a local level.

Implementation and use of the dataset is likely to require changes to variable definitions, terminology and data collection strategies. For example, the definition of postoperative mortality to include a 30 day time limit may be possible if local resources for data collection are available. It is important that the changes are well motivated and communicated to the network of intended data users. The frequency of review of the dataset may depend on demonstrating successful initial (pilot) registry implementation.

Further work is needed to understand how clinicians can feasibly contribute to a facility dataset to describe the context of clinical settings and its impact on patient care. This requires collaboration between clinicians, global surgery advocates, government stakeholders and policy-makers.

Conclusion

This consensus study defining a minimum perioperative dataset is a crucial first step in a collaborative effort to establish a perioperative registry for African researchers.

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Ethics declarations

Conflict of interest

RP has received research grants and/or honoraria from Edwards Lifesciences, Intersurgical and GlaxoSmithkline. GJB receives speakers' fees for talks on pain and rehabilitation. All other authors declare no conflict of interest.

Informed consent

Informed consent was obtained from all participants included in this study.

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