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Improving quality of surgical and anaesthesia care in sub-Saharan Africa: a systematic review of hospital-based quality improvement interventions

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ABSTRACT

Objectives To systematically review existing literature on hospital-based quality improvement studies in sub-Saharan Africa that aim to improve surgical and anaesthesia care, capturing clinical, process and implementation outcomes in order to evaluate the impact of the intervention and implementation learning.

Design We conducted a systematic literature review and narrative synthesis.

Setting Literature on hospital-based quality improvement studies in sub-Saharan Africa reviewed until 31 December 2021.

Participants MEDLINE, EMBASE, Global Health, CINAHL, Web of Science databases and grey literature were searched.

Intervention We extracted data on intervention characteristics and how the intervention was delivered and evaluated.

Primary and secondary outcome measures Importantly, we assessed whether clinical, process and implementation outcomes were collected and separately categorised the outcomes under the Institute of Medicine quality domains. Risk of bias was not assessed.

Results Of 1573 articles identified, 49 were included from 17/48 sub-Saharan African countries, 16 of which were low-income or lower middle-income countries. Almost two-thirds of the studies took place in East Africa (31/49, 63.2%). The most common intervention focus was reduction of surgical site infection (12/49, 24.5%) and use of a surgical safety checklist (14/49, 28.6%). Use of implementation and quality improvement science methods were rare. Over half the studies measured clinical outcomes (29/49, 59.2%), with the most commonly reported ones being perioperative mortality (13/29, 44.8%) and surgical site infection rate (14/29, 48.3%). Process and implementation outcomes were reported in over two thirds of the studies (34/49, 69.4% and 35, 71.4%, respectively). The most studied quality domain was safety (44/49, 89.8%), with efficiency (4/49, 8.2%) and equitability (2/49, 4.1%) the least studied domains.

Conclusions There are few hospital-based studies that focus on improving the quality of surgical and anaesthesia care in sub-Saharan Africa. Use of implementation and quality improvement methodologies remain low, and some quality domains are neglected.

PROSPERO registration number CRD42019125570

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Our review includes hospital-based quality improvement interventional studies for anaesthesia and all surgical specialities in sub-Saharan Africa.
⇒ Clinical, process and implementation outcomes are captured.
⇒ An assessment of quality domains was undertaken.
⇒ Our search was restricted to English-language articles only and it is possible that our findings have missed studies published from Francophone, Portuguese or German-speaking countries.
⇒ It is possible that some studies were missed due to the diversity of the terms used in the literature.

INTRODUCTION

The 'Lancet Global Health Commission on High Quality Health Systems in the Sustainable Development Goals Era' report has highlighted that it will not be possible to reduce excess mortality and disability without addressing poor quality of healthcare in low-income and middle-income countries (LMICs).[1] In these settings, more than 5 million excess deaths per year are attributed to poor-quality care, leading to estimated economic welfare losses of $6 trillion.[2] In addition, two-thirds of the estimated 23 million disability-adjusted life-years lost each year due to in-hospital adverse events, reflective of poor quality, occur in LMICs, despite lower utilisation of healthcare facilities.[3]

In sub-Saharan Africa (SSA), an estimated 93% of the population do not have access to safe, affordable and timely surgical and anaesthesia care, when needed.[4] Current evidence suggests that mortality in surgical patients in Africa is two times higher than the global average, despite patients being younger, having a lower-risk profile and developing fewer complications.[5] Morbidity in surgical patients is also higher and the risk of surgical site infections (SSIs), the most common type

of healthcare-associated infection in African surgical patients, is much higher than that reported in USA and Europe.[5 6]

To achieve reduction in mortality and morbidity from surgical diseases, consistent delivery of high-quality evidenced-based surgical care is required.[1 4 7 8] This need can be partly addressed through evidence-based hospital-level quality improvement (QI) interventions.[8] However, health systems are complex and adaptive and can respond in predictable and unpredictable ways to interventions,[8 9] and thus translating and implementing evidenced-based QI interventions into routine clinical practice within a particular context, in dynamic and diverging 'real-world' conditions that are influenced by human relationships and behaviours, remains challenging worldwide[10 11] and is particularly challenging in the SSA context.[10 12]

To support the implementation and sustainable integration of evidence-based QI interventions in novel settings within complex surgical care environments, the use of QI methods[13–16] and implementation science methods[17 18] needs to be expanded. Improvement science is the scientific approach to achieving better patient experience and outcomes through changing provider behaviour and organisation, using systematic change methods and strategies. Implementation science is the scientific study of methods to promote the uptake of research findings into routine healthcare—practice or policy. Studying QI implementation will allow researchers to distinguish between failure occurring because the intervention was ineffective (intervention failure), from failure occurring because the implementation was ineffective (implementation failure). It will also ensure quality and rigour of the evaluation of implementation process.[17] However, improvement and implementation science methods are rarely employed in LMIC settings, and other investigators have noted that QI methods should be used more widely.[12] In addition, implementation science frameworks[18] should be applied, implementation strategies used[19] and implementation outcomes measured[20] to assess the effectiveness of the implementation of any intervention.

Quality is a complex construct and challenging to define. The Institute of Medicine (IOM) defines quality of care as 'the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge'.[21] In 2001, the IOM, defined the desirable characteristics of high-quality healthcare systems, through six domains of safe, timely, effective, efficient, equitable and patient centred care,[22] expanding the Donabedian model that described quality of care across three domains—structures, processes and outcomes of care.[23] Evaluating the IOM quality domains can improve the evaluation of QI interventions, beyond that of clinical effectiveness.[1 22]

To support the current research agenda for improving quality of surgical care in LMICs, we conducted a systematic review on hospital-based QI interventions in SSA, published from 2008 to 2021. The objectives of this review were to describe the state of QI research and programmatic initiatives in surgical and anaesthesia care, to understand the areas of intervention focus and the use of QI or implementation methodologies, to capture the outcomes studied and to identify the IOM quality domains that were addressed in the studies.

METHODS

Design

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[24] The study was registered with PROSPERO (CRD42019125570) and the protocol was published.[25]

Eligibility criteria

The inclusion eligibility criteria as published in the protocol[25] are displayed in table 1.

Search strategy

The following databases were searched from 1 January 2008 to 31 December 2021[26]: MEDLINE (Ovid), EMBASE (Ovid), Global Health (Ovid), CINAHL and Web of Science (Clarivate Analytics). The search strings for this review were as follows: (1) surgical and anaesthesia care, (2) QI hospital-based interventions and (3) SSA countries.[25] Our search was limited to studies published in English. The articles identified through all sources as described above, were collated and deduplicated in EndNote 20.[27]

To identify grey literature QI interventions, the following sources were searched: (1) the Scopus (Elsevier's) citation database, (2) first 50 hits from Google search, (3) documentation and reports of relevant national and international health organisations.[25 28] In addition, a reference list of all included articles was handsearched and all relevant literature was included.

Study selection

To identify articles that specifically addressed the quality of surgical and anaesthesia care at the hospital level, we excluded articles that were primarily related to improving access to surgical care, rather than the quality of surgical care. For example, studies on increasing surgical volume or referral processes from community and primary care to secondary and tertiary care were excluded as they focus on improving *access* to care as opposed to quality of care provided. In addition, we excluded studies with a primary focus on delivery of educational/training programmes (basic surgical/anaesthesia skills, essential emergency care training) that were not part of a hospital-based QI intervention, and studies that did not explicitly relate to surgical patients.

All articles were initially screened by a team of three reviewers (IOM-B, HS and VC) by title and abstract using Rayyan open web-based software.[29] All reviewers were trained by the first author (NB) on how to apply eligibility

Table 1 Inclusion and exclusion criteria

	Include	Exclude
Type of article	All peer-reviewed research articles Non-research reports from national or international health organisations, dissertations/theses, books/book chapters, conference abstracts and research in progress from grey literature	Unstructured reviews or overviews, theoretical papers, commentaries or opinion papers, Case studies, audits, editorials/ letters/ comments, newspapers/trade journals, literature reviews Guidelines, strategies and policies from national or international health organisations
Type of conditions	Any surgical and anaesthesia care (operative or non-operative); type of presentation (elective or emergency); subspecialty surgical or anaesthesia care (including perioperative medicine and pain management)	*Trauma/injury care Studies on cosmetic and aesthetic surgical care and sports medicine
Type of population	Population with specific surgical diseases or conditions Adults, neonatal and children's surgery	Non-human animals
Care setting	Hospital setting, within SSA countries	Studies that are not conducted in hospital-based settings. Studies that took place outside of SSA
Type of design	Interventional studies†[98] that report an assessment of any outcomes relevant to quality improvement‡	Observational or descriptive studies Studies that report outcomes that are not relevant to quality improvement
Subject of study	Quality improvement of surgical care in following areas§ ► Service delivery ► Health Workforce ► Information ► Financing ► Leadership/governance	Studies that did not assess outcomes. Medical device production and new clinical technological devices Introduction of new procedures Medical products, vaccines and technologies

*Studies related to trauma/injury were excluded from this review, as there was another review undertaken at the same time looking specifically at trauma care in LMICs.
†Interventional studies are specifically tailored to evaluate direct impacts of treatment or preventive measures on disease and are those where the researcher intervenes at some point throughout the study.
‡Quality improvement is defined as any actions or strategies taken to improve the quality of healthcare delivery or patient outcomes that directly or indirectly involves care delivery to patients or by staff.
§WHO Health System building blocks related to the delivery processes of surgical care ('Medical products, vaccines and technologies' block was excluded as it is considered to be primarily related to the structural aspects of the health system as opposed to the healthcare service delivery processes).
LMICs, low-income and middle-income countries; SSA, sub-Saharan Africa.

criteria and were asked to screen 30 articles using these criteria. These articles were reviewed by NB before the team (all three reviewers and NB) met to discuss and resolve any discrepancies identified. This process was repeated by reviewing a further set of 30 articles, until agreement over 85% was reached for all reviewers. All articles were then put back into the main pool and equally divided between reviewers who screened the articles by title and abstract independently. To maintain a high level of consistency, NB double screened at least 30% of all articles that were allocated to each reviewer throughout this screening stage. Articles proceeded to full-text screening if there was uncertainty between the reviewers about their inclusion based on title and abstract review. All articles selected for full text screening were reviewed in duplicate by NB and IOM-B. If there was disagreement between the two reviewers, the two senior coauthors (AJML and JD) were asked to discuss and reach consensus on inclusion or exclusion.

Data extraction

All information was extracted into a predeveloped data collection form, that was piloted and revised before entering the data.[25]

Data extracted were:

1. Basic characteristics—information on first author, the country or countries where studies took place, year of publication, information on study methodology, study design, sample size.
   Study methods were initially categorised as qualitative, quantitative or mixed methodology, and further as a randomised design (eg, randomised controlled trial (RCT)) or non-randomised design (quasi-experimental with time series design, quasi-experimental with

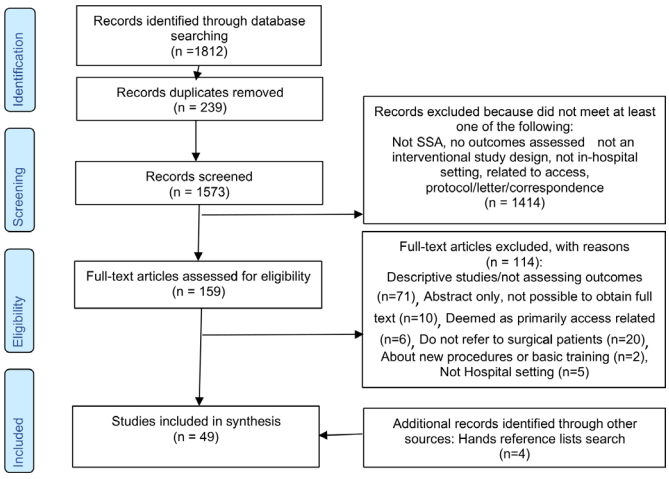

Figure 1 PRISMA flow chart. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

control group before and after or quasi-experimental uncontrolled before–after study). The latter order represents the hierarchy of methodological strength.[30]

2. Intervention characteristics were as follows: study summary, intervention focus, intervention description, number of hospitals included in the study and hospital level (tertiary or district), whether QI or implementation science methods were used, IOM quality domains that the intervention intended to improve and defined as:
   a. Safe: Care in healthcare facility should be safe as care in your home.
   b. Timely: No waits or delays during care delivery.
   c. Effective: Care should be science based and evidence based.
   d. Efficient: Care that delivered and services provided should be cost-effective.
   e. Equitable: There should be no disparities in care for different type of population (patient and staff).
   f. Patient centred: Healthcare system should revolve around patients.
3. Outcomes were captured as clinical, process, implementation and others. Clinical outcomes were in-hospital perioperative mortality within 30 days and morbidity (SSI, other infections); any additional clinical outcomes that did not fit in one of those categories were listed as 'other'. Process outcomes were variables related to the delivery of care (eg, waiting times, length of hospital stay and blood availability). Implementation outcomes were the implementation outcomes described by Proctor *et al*[20] that determine the success of an implementation effort by assessment of several subjective and objective criteria including the following:
   a. Acceptability: perception among stakeholders that the new intervention is agreeable.
   b. Adoption: intention to apply new intervention.
   c. Appropriateness: perceived relevance of the intervention for the setting and problem.
   d. Feasibility: extent to which an intervention can be applied.
   e. Fidelity: the proportion of management protocol components completed as intended.
   f. Penetration: the proportion of eligible patients who actually receive the intervention.
   g. Cost: costs of the intervention, including the delivery strategy.
   h. Sustainability: extent to which a new intervention becomes routinely available/is maintained post introduction.

For the studies that defined mortality as the primary outcome, the assessment of the quality of evidence using GRADE criteria was planned (see the protocol for full details).[25]

The quality of study conduct, trustworthiness of findings and the risk of bias assessment was not our primary aim.

Data synthesis and analysis

A descriptive and narrative synthesis of the data was undertaken.[31] Meta-analysis was not possible, due to high heterogenicity of the data reported in the included studies. All data are reported as categorical variables, apart from brief description of the intervention that was given as a narrative summary. The number of studies reported over time was presented graphically. The results are described as the number of studies that were categorised under outcomes as described above.

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination of our research.

RESULTS

Study selection

After duplicate removal, we screened 1573 articles (figure 1). We included 49 articles in the final analysis. The 49 articles represent 39 studies as 4 studies[32–39] had 2 articles published and 2 studies[40–45] had 3 articles published. These articles reported different aspects or outcomes of the studies, therefore, were included as separate articles.

Basic characteristics

The studies were conducted in 17 out of 48 countries in sSA. All but one (16/17, 93.3%) were low-income-level or lower-middle-income-level countries (figure 2). Almost two-thirds of the studies were conducted in East Africa (31/49, 63.2%), mostly (24/31, 77.4%) in Ethiopia, Kenya, Tanzania and Uganda. A quarter of eligible articles were from West Africa (12/49, 24.5%) with 5/12 (41.7%) from Nigeria and 4/12 (33.3%) from Benin. The four articles in the Southern Africa region (4/49, 8.2%) were all conducted in South Africa. Only two studies were from the Central Africa region (2/49, 4.1%). There was a multicountry study which was conducted in four countries involving Kenya, Uganda, Zambia and Zimbabwe.[46]

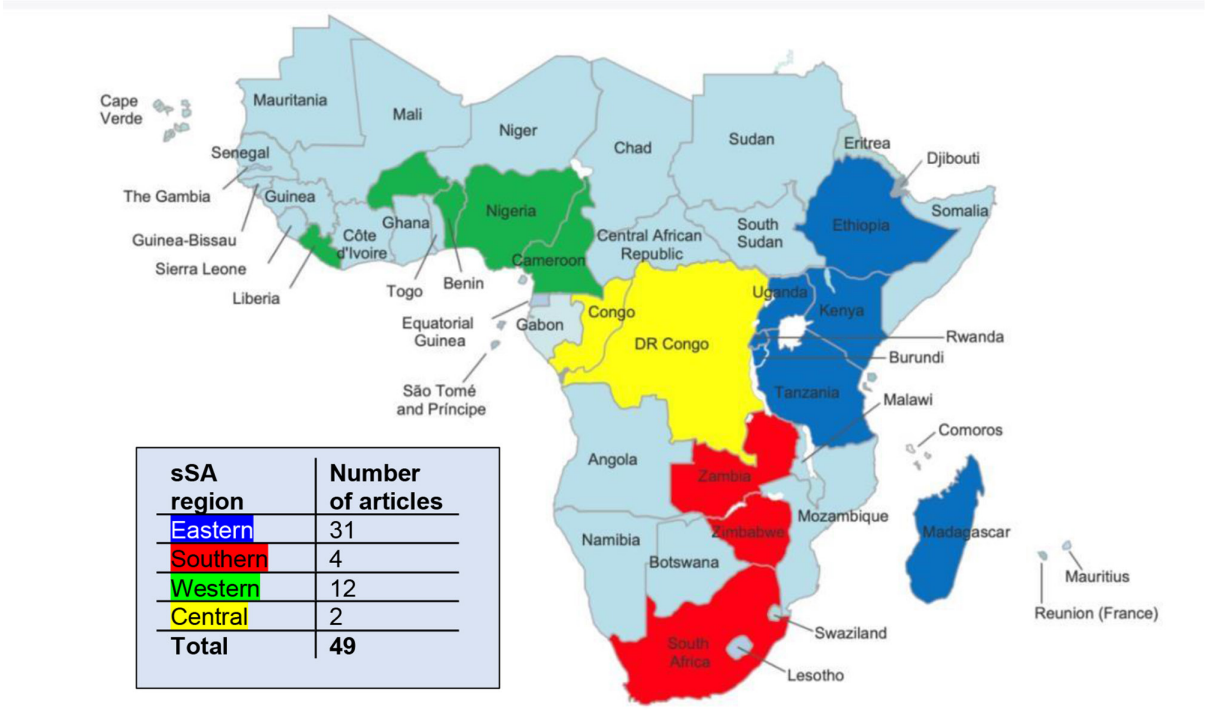

Figure 2 Sub-Saharan African countries featured in the systematic review.

Over time there was an increase in the number of published studies on QI. (figure 3)

The majority of studies used quantitative methods (34/49, 69.4%) while over a quarter (15/49 30.6%) used a mixed-method analysis. Six out of 49 (12.2%) studies were RCTs and 43 (87.8%) studies used quasi-experimental designs.[30] Three out of 43 studies with quasi-experimental designs used time series quasi-experimental design (3/43, 7.0%). The majority of studies (40/43, 93.0%) used either uncontrolled or controlled before-and-after quasi-experimental design. Only 11 studies defined a sample size using statistical sample size calculation (11/49, 22.5%), the remaining (38/49, 77.6%) used a convenience sampling technique, with wide variability of sample sizes ranging from 31 to over 3000 patients. Eleven out of 49 studies (22.5 %) did not perform any formal statistical tests with many studies reporting descriptive findings as percentages only.

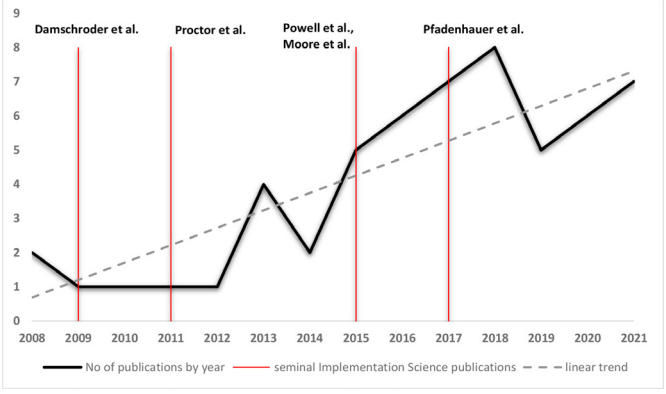

Figure 3 Number of publications by year and linear trend over time with dates of seminal implementation science publications.[19 20 91–93]

Intervention characteristics

The most common intervention foci were use of a surgical safety checklist (14/49, 28.6%) and reduction of SSI (12/49, 24.5%). Other intervention foci identified included: behaviour change, clinical decision making, some condition-specific areas, enhanced recovery after surgery, infection prevention control (IPC), quality of life (QoL) and pain management. More details and summary description of these interventions is presented in table 2. Most studies were conducted in a single hospital site (27/49, 55.1%) in a variety of tertiary (23/27, 85.2%) and district (4/27, 14.8%) hospital settings. Studies done in multiple hospitals (22/49, 44.9%) were conducted in tertiary (8/22, 36.4%), mixed (11/22, 50.0%) or not specified (3/22, 13.6%) hospital settings. Studies across multiple sites were conducted in 2–36 hospital sites, half (11/22) of which were performed in 10 or fewer hospitals and 5/22 (22.7%) were conducted in between 10 and 20 hospitals (>10 to ≤20) hospitals and the remaining 6/22 (27.3%) in over 20 hospitals (full distribution is presented in online supplemental appendix 1). Only eight articles mentioned the use of QI methods. Five of these studies used Plan–Do–Study–Act cycles,[37 38 43 44 47] one used QI collaboratives,[48] and two used audit and feedback as the QI method.[49 50] Use of implementation science frameworks was rare with only two studies using frameworks to support intervention implementation and the evaluation of implementation.[51 52]

When assessing what IOM quality domains were intended to be improved by the QI interventions, 44/49

Table 2 Intervention characteristics, N=49

Characteristics	Grouping	
Intervention focus	**Intervention description**	**Counts, N=49**
Behaviour change	Implementation of an interdisciplinary surgical non-technical skills training programme[99]	1
Clinical decision-making	Reduction of caesarean section rates[59]	1
Condition specific	Gastroschisis care protocol for neonatal surgery[53] Gastrointestinal surgical critical care service for emergency patients[100]	2
Enhance recovery after surgery	Elective surgery[101] Emergency surgery[60]	2
Hospital electronic record database	Surgical adverse events/surgical in-patient data recording[61 62] Multicentre cloud-based perioperative register[50]	3
Hospital leadership	Continuous quality improvement/assurance programmes[34 35]	2
Infection Prevention Control	Equipment sterilising[63 64]perioperative antibiotic prophylaxis[65]	2 1
WHO Safe Surgery 2020	Multicomponent safe surgery intervention[38]	1
Pain management	Pain guideline[48] Postoperative pain round[66] Analgesic dosing[67]	3
Patient communication	Preoperative counselling[102]	1
Preoperative optimisation	Control of hypertension presurgery[68]	1
QoL	Patient education and physiotherapy to improve outcomes of obstetric fistula surgery[36 37 47]	3
Reduction of SSIs	Perioperative antibiotic prophylaxis[32 69–72]	5
	Surveillance of SSI[33 45]	2
	Surgical hand preparation[73]	1
	Multimodal intervention[43 44 46 74]	4
WHO Surgical Safety Checklist	Nationwide implementation[40–42 51 52]	5
	Multiple hospitals implementation[75–77]	3
	Single site hospital implementation[49 78–81]	5
	Surgical Safety Checklist Use and PostCaesarean Sepsis[39]	1
Setting	Hospital level	
Single hospital site	Tertiary[33 36 37 44 45 47–49 53 60–62 65 67 72 74 78–81 100–102]	23 (46.9%)
	District[32 66 71 73]	4 (8.2%)
Multiple hospital site	Tertiary[35 40–43 50 69 75]	8 (16.3%)
	Mixed[34 38 39 46 59 63 64 70 76 77 99]	11 (22.2%)
	Not specified[51 52 68]	3 (7.0%)
Use of Implementation Science framework for implementation of the study	Yes[51 52]	2 (4.1%)
	No	47 (95.9%)
Use of quality improvement methods for delivery of the study	Yes[34 35 43 44 48–50 81]	8 (16.3%)
	No	41 (83.7%)
IOM quality domains addressed	Safe[32–35 40–42 44–46 48 51–53 59–81]	44 (89.8%)
	Timely[40 64 74 76 79 100]	6 (12.2%)
	Effective[32 33 45 46 48 53 59 60 64–74 102]	25 (51.0%)
	Efficient[32 65]	4 (8.2%)
	Equitable[61 62]	2 (4.1%)
	Patient-centred*[35–37 47 48 60 66 67 102]	9 (18.4%)

*QoL, patient perception to the fistula repair programme, patient feeling on receiving anaesthesia, pain score, collaborative relationships—relationship formed during consultation between patient and staff.
IOM, Institute of Medicine; QoL, quality of life; SSI, sub-Saharan Africa.

(89.8%) of studies focused on the safety quality domain. Effectiveness was the second most common quality domain (24/49, 49.0%), followed by studies on patient-centredness (9/49, 18.4%) and timeliness (6/49, 12.2%). Efficiency (4/49, 8.2%) and equitability (2/49, 4.1%) were the least studied domains. Most studies assessed two domains (median 2, IQR (1–2), min-max (1–4)). Table 2 presents the detailed description of implementation characteristics.

Of the WHO Health System blocks, all articles presented at least three of the five Health System building blocks of interest-Governance and Leadership, Human Resources and Service Delivery. Health information and Finance were the least commonly addressed building blocks (15/49, 30.6% and 3/49, 6.1%, respectively).

Outcomes

All articles reported more than one category of outcomes. Clinical outcomes were reported in 29/49 (59.2%) studies. Perioperative mortality was reported in 13 out of 29 studies and only one study defined it as a primary outcome. Surgical complications were reported in 14/27 (51.6%) as SSI and in 17/29 (34.7%) as other complications. Seventeen studies reported other clinical outcomes (listed in table 3). All studies that reported on clinical outcomes reported more than one clinical outcome (table 3).

The process outcomes were reported in 34/49 (69.4%) studies. Most of those reporting process outcomes (29/34, 85.3%) reported multiple process outcomes, one collecting over a thousand variables to form a composite outcome measure.[34] We defined subcategories of process outcomes based on the themes that were identified from the extracted outcomes. All other outcomes were classified within the broad group due to the heterogeneity of the measures used in studies (see details in table 3).

Implementation outcomes were reported in 35/49 (71.4%) studies. The number of implementation outcomes reported per study varied from 0 to 6 (median 2). Adoption (20/35, 57.1%) and penetration (18/35, 51.4%) were reported most often, followed by acceptability (13/36, 26.5%), feasibility (10/35, 20.4%), fidelity (9/35, 18.4%), sustainability (9/35, 18.4%) and appropriateness (8/35, 16.3%). Cost of implementation was the least reported (2/35, 5.7%).

All outcomes that did not fit into clinical, process or implementation categories were coded as 'others' (29/49, 52.2%) and individual categories were made where possible. Although at the screening stage we excluded studies that aimed to only improve service structure, we found that many studies assessed structural outcomes as part of the baseline quality assessment of the surgical care services. Structural outcomes (eg, infrastructure, availability of equipment and resources, supply of medicines, materials, number of staff) formed one of the biggest categories in 'other' (24/49, 49.0%), this was followed by cost of treatment, staff/patient satisfaction,

Table 3 Outcomes, N=49

Outcome category, n* of studies reported each category	Outcome subcategories according to the common themes identified	n*, (%)
Clinical, n=29 (59.2%) Broad categories of clinical outcomes reported	Perioperative mortality	13 (26.5%)
	SSI	14 (28.6%)
	Other surgical complications excluding SSI	17 (34.7%)
	Other clinical (adverse events, measure of pelvic floor muscles strength, pain score, quality of life)	17 (34.7%)
Process, n=34 (69.4%) Broad categories of process outcomes reported	Length of stay, waiting time, delays within facilities	8 (16.3%)
	Safety procedures	7 (14.3%)
	Adherence to a protocol	5 (10.2%)
	Other process (attendance, postoperative and preoperative care, number of inpatient admissions, no of follow-up visits, staff time, data quality recorded, number of therapy sessions for patients, dose frequency, surgery booking status, completeness and accuracy of electronic records)	14 (28.6%)
Implementation, n=35 (71.4%)	Acceptability	13 (26.5%)
	Adoption	20 (40.8%)
	Appropriateness	8 (16.3%)
	Feasibility	10 (20.4%)
	Fidelity	9 (18.4%)
	Cost	2 (4.1%)
	Penetration	18 (36.7%)
	Sustainability	9 (18.4%)
Other, 29 (59.2%)	Structural	24 (49.0%)
	Cost of treatment/materials†	4 (8.2%)
	Staff/patient satisfaction	4 (8.2%)
	Behaviour related‡	3 (6.1%)
	Training outcomes (change in knowledge, skills and attitude at assessment)	3 (6.1%)
	Collaborative relationship§	1 (2.0%)
	Interobserver agreement	1 (2.0%)
	Patient asked about side effects and feeling of receiving dose of ketamine	1 (2.0%)
Formal use of Evaluation Frameworks, n=7 (14.3 %)	Donabedian Model[23]	2 (4.1%)
	Kirkpatrick[103]	3 (6.1%)
	Implementation Outcome Taxonomy by Proctor *et al*[20]	2 (4.1%)

The reporting of study methods and results were suboptimal. Recommended reporting guidelines were rarely cited (7/49, 14.3%).
*The total in each type can exceed the total number of articles (N=49), due to studies reporting several outcomes from the same category and more than one category in the same study.
†Cost of a drug or a single item provided to make it possible for an intervention to take place. It contributes to the cost of implementation, however, it is not possible to calculate cost of implementation based on this data alone. Implementation cost is the cost impact of implementing effort and will depend on three components: the costs of the particular intervention, the implementation strategy used and the location of service delivery.[20]
‡Relationship formed during consultation between patient and staff and assessed using a special proforma.
§Change in behaviour following training, behaviour change using WHO Behaviourally Anchored Rating Scale (WHOBARS), attitude.
SSI, Surgical Site Infection.

QoL, behaviour related and training evaluation. Use of evaluation frameworks was rare (7/49, 14.3%) (table 3).

As only one study defined mortality as the primary outcome,[53] the assessment of the quality of evidence using Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria was not undertaken as planned in the protocol.

DISCUSSION

We found fewer than 50 studies that focused on improving the quality of surgical and/or anaesthesia care in hospitals in SSA. The majority of these studies focused on the quality domains of safety and effectiveness of care, with little focus on efficiency, equitability, timeliness and patient-centredness. In addition, fewer than 10 studies used recognised QI or implementation science methods to support intervention implementation. However, a large proportion of studies used at least one implementation science method during assessment of findings. Studies were concentrated in a limited number of countries within SSA, despite the known challenges of poorer surgical outcomes across the continent compared with high-income settings.

The paucity of QI studies that we found aligns with the wider global health systems literature reporting that access to healthcare has been prioritised over the quality of healthcare delivery.[1] However, surgical and anaesthesia teams across the continent are, on a daily basis, striving to improve the quality of care within their own hospital environments outside the context of organised QI programmes or research studies. The ASOS 2 study is one of the best examples of QI research.[54] However, the enhanced postoperative surveillance for high-risk surgical patients in ASOS 2 failed to produce improved outcomes in this study. This may well have been due to local context—specifically the degree of buy-in from local teams.[55] We think that we need more QI studies and we need studies to embrace implementation science methods to maximise chance of improved surgical and anaesthesia outcomes.

Despite previous work suggesting that 5 billion people lack access to safe, effective and timely surgical care if required,[4] recent modelling has suggested that poor quality care is now a bigger barrier to reducing mortality than insufficient access, including for surgical care.[1 2] Indeed, a large epidemiological study of surgical patients in hospitals across SSA has shown perioperative mortality rates that are two times higher than the global average, despite patients being younger, having a lower-risk profile and developing fewer complications.[5] Similar findings of worse outcomes after surgery in SSA have been seen in other studies of general or disease-specific surgery.[5 6 56–58] Although the worse outcomes seen in these studies have a range of determinants including late presentation, the quality of care is a common theme which unites them.

Quality is a multidimensional concept and difficult to define. Donabedian was the first to address the issue of quality in healthcare. Later, at the turn of the century, the IOM report 'To Err is Human' highlighted the scale and impact of errors in healthcare, with a focus on safety in healthcare. Various institutions have produced quality frameworks with many embracing the domains of effective, efficient, timely, equitable, safe and patient-centred care. Quality, alongside access and financial risk protection are key aspects of universal health coverage as stated in SDG3.8. More recently, a quality health system framework from a Lancet Global Health Commission, included processes of care, health system foundations and quality impacts. We chose to analyse quality using the IOM domains which have a more clinical QI focus rather than a broader health system perspective on quality healthcare. Nevertheless, we acknowledge that in categorising quality, the interactions between individual categories are lost. Providing an analysis of the trade-offs and reinforcements between categories of the IoM framework is beyond the scope of our review.

We found that almost all the studies focused on either safety[32–35 40–42 44–46 48 51–53 59–81] and/or effectiveness of care, with a lack of focus on other domains of quality. The prioritisation on safety was not surprising given the well-recognised magnitude of the patient safety problem[21] and the resultant global movement to improve patient safety. The WHO is a global leader in establishing safety norms and standards and supporting country efforts in developing patient safety policies and practices. Two global patient safety reports relate specifically to safety in surgical care; one on the role of the surgical safety checklist,[82] and the other on actions to reduce healthcare associated infections, paying particular attention to SSIs.[57 83] It is clear that these WHO priorities are influencing the focus of hospital-based QI efforts; 14 of the studies which we found focused on the surgical safety checklist,[40–42 49 51 52 75–81] 12 studies on SSI[32 33 43–46 69–74] and 3 studies on Infection prevention and control (IPC)—2 on sterilisation[63 64] and 1 on IPC policies.[65] However, despite the number of studies focussing on safety, the number of safety issues addressed were few. For instance, we found that none of the studies were based on postoperative ward based care, which is another safety quality issue that has recently been recognised as a problem.[5]

We also found that clinical effectiveness outcomes were not regularly assessed. We acknowledge that clinical outcomes are often complex to define and capture and can occur after discharge when patients in resource limited settings are often lost to follow-up. Process measures are easier to collect which may be why we found that these outcomes were more often collected than clinical outcomes, despite sometimes tenuous links between process and clinical outcomes.[84 85]

Promoting safety and effectiveness are undoubtedly key factors for providing high-quality surgical care. However, improvements in the other IoM domains are needed to ensure the optimal use of resources in constrained settings and the delivery of services that are responsive to

patient's needs, which will help to engender trust in those services.[22]

We found few studies using QI methods,[86–88] and few studies used implementation science methods[10 12 17 89] which is of concern, as benefits of using these methods to support the delivery of evidence-based QI practices into routine healthcare, have been clearly demonstrated as critical to close the implementation gap. Indeed, there is wide acceptance that there is an implementation gap[10 90] in scale up of evidenced based interventions into routine care in LMICs in general, and in surgical and anaesthesia care in particular.[10 17 89 90] Over the last two decades there have been seminal publications on implementation science including the Consolidated Framework for Implementation Research, which was originally published in 2009,[91] Proctor's Implementation Outcomes in 2011[20] and the Expert Recommendations of Implementing Change in 2015.[19] The Medical Research Council (MRC) guidance on process evaluation was also published in 2015.[92] Finally, the Context and Implementation of Complex Interventions framework was published in 2017.[93] Our review covered publications from 2008 to the end of 2021 (figure 3) and only found two articles that mentioned any of the above methods.

Although there was no formal mention of formal implementation science frameworks in the majority of studies, we found that over two-thirds of studies reported at least one implementation outcome as defined by Proctor *et al*.[20] The most common reported implementation outcomes were adoption and penetration, with other outcomes being rarely reported, despite their well-recognised utility for assessing the likelihood that the intervention can be sustained, rolled out at scale or rolled out elsewhere.[94] The least assessed implementation outcome was implementation cost, whereas in any health system, and especially resource-constrained settings, costs of the intervention itself and cost of implementation of the intervention, are essential to inform uptake of interventions.[95]

To address the implementation gap of successfully implementing and scaling up evidence-based interventions in 'real-world' conditions,[90] high-quality implementation research needs to remain high on the global health research agenda.[12] Implementation outcomes are of particular interest as they provide details on how and why the intervention implementation may need to change.

We also found that the quality of reporting of studies, in general, was not optimal. Many studies had issues of transparency and accurate reporting of basic parameters such as the follow-up period, type of population, study setting, study design, year when the study took place, length of follow-up and the names of statistical tests used. Several reporting guidelines exist that have been shown to be effective in improving reporting of research, limiting possibilities for information omission and helping the reader to understand and be able to replicate the study. We found that the use of recommended reporting guidelines were rarely reported in the papers.[96]

This study has several limitations. Our search terms restricted the search to interventional studies related to surgical and anaesthesia care QI and we included many synonyms related to dimensions of quality. It is possible that we missed some studies that did not specifically mention quality or one of the synonyms we used. However, by choosing search terms related to 'surg', 'quality' and 'hospital', we believe all articles that framed their research as related to quality of surgical and anaesthesia care have been captured. Our search was restricted to English-language articles only and it is possible that our findings are regionally biased towards SSA Anglophone countries.

Despite these limitations, this review is the first to include hospital-based QI interventions for all fields of surgery (excluding trauma, as we have recently assessed this in a separate review) in SSA.[97] This is also the first systematic literature review to synthesise the information on surgical and anaesthesia quality of care using clinical, process and implementation outcomes that have been measured and assessed as part of QI interventions.

Conclusions

This systematic review has shown a paucity of QI studies on surgical and anaesthesia care, with the majority addressing the safety and effectiveness quality domains. In research settings, implementation and improvement methods are not adequately employed to address the current implementation gap for introduction of evidence-based interventions to improve the quality of surgical and anaesthesia care. To address the implementation gap of successfully implementing and scaling up evidence-based interventions in 'real-world' conditions,[90] high-quality implementation research needs to remain high on the global health research agenda.[12] Implementation outcomes are of particular interest as they provide details on what, how and why the intervention implementation may need to change.

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