Perioperative medicine: challenges and solutions for global health

Abstract

The emerging field of perioperative medicine has the potential to make significant contributions to global health. Perioperative medicine aims to help reduce unmet surgical need, decrease variation in quality and systematically improve patient outcomes. These aims are also applicable to key challenges in global health, such as limited access to surgical care, variable quality and workforce shortages. This article describes the areas in which perioperative medicine can contribute to global health using case studies of successful care pathways, risk prediction tools, strategies for effective grassroots research and novel workforce approaches aimed at effectively using limited resources.

Key words: Global health; Global surgery; Low and middle income countries; Perioperative medicine; Postoperative outcomes; Quality improvement; Surgical care

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Introduction

Perioperative medicine is an emerging field with the potential for significant contributions to global health (Shenouda et al, 2023). Perioperative medicine describes a coordinated approach to improving patient and population level outcomes for patients needing surgery. Until now, its focus has largely been in high resource settings, where it has sought to improve care by seeking incremental gains. In parallel with this work, there has been increasing focus on and advocacy for surgical care in global health (ie global surgery), largely in health systems that are more poorly resourced. The contextual differences between these disciplines, in terms of healthcare systems, disease burdens and cultures, require adapted methods if potential synergies are to be achieved.

This article defines and describes perioperative medicine and global surgery, the challenges that both disciplines are attempting to overcome, and the methods they use. It also identifies existing and potential opportunities for productive collaboration going forward.

Perioperative medicine

Perioperative medicine is defined by the Royal College of Anaesthetists (2015) as the 'coordination of the multidisciplinary team from contemplation of surgery to full recovery'. Perioperative medicine aims to help reduce unmet surgical need, decrease variation in quality and systematically improve patient outcomes. The Centre for Perioperative Care, a cross-organisational, multidisciplinary initiative in the UK, seeks to improve quality of care, patient experience and satisfaction, health of populations (including quality of life), and the value of care (https://cpoc.org.uk).

The use of perioperative medicine has arisen in high resource settings to meet the challenge of rising demand for, and costs of, surgery posed by an increasingly aged and comorbid population. The numbers of patients at higher risk of perioperative complications and ensuing morbidity, mortality and economic costs is rising. Additionally, up to one-third of cancellations on the day of the surgery are for clinical reasons, such as the patient being unfit for surgery or anaesthesia (Wong et al, 2018). Perioperative medicine is therefore a priority in the NHS Plan to improve quality and efficiency to tackle the backlog in elective care in the wake of the COVID-19 pandemic (NHS England, 2023a).

The strategies that perioperative medicine uses to drive improvement include the development of coordinated pathways (for example to help optimise patients for surgery and reduce risks of cancellations), risk prediction to inform shared decision making (Shaw

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Table 1. Examples of successful perioperative medicine strategies

Perioperative medicine strategy	Aim(s)	Examples
Care pathways	■ Reduce cancellation rates ■ Reduce complication rates ■ Improve integration with primary care	■ Centre for Perioperative Care (2023) case studies ■ NHS England (2023a) case studies
Risk prediction	■ Enable shared decision making ■ Facilitate planning of postoperative care	■ Surgical outcome risk tool (Protopapa et al, 2014) ■ Shared decision making (Shaw et al, 2023) ■ Choosing Wisely UK (2023)
Data, research and quality improvement	■ Collect data to evaluate and support the improvement of the quality of care	■ The Perioperative QI Programme (Moonesinghe et al, 2022)
Workforce	■ Increase flexibility of existing workforce to adapt to new ways of working ■ Improve retention of staff	■ NHS England (2023b) perioperative care workforce strategy

et al, 2023), data collection, research and quality improvement, and system-level approaches to address workforce constraints (Table 1).

Global surgery

As with perioperative medicine, global surgery is relatively new on the global health agenda. In 2015, the Lancet Commission for Global Surgery (Meara et al, 2015) outlined the huge unmet treatable burden of surgical disease in poorer resourced health systems, with health, social and economic consequences. Specifically, it concluded that '5 billion people do not have access to safe affordable surgical and anaesthesia care when needed' (Meara et al, 2015). Similarly, the Global Burden of Disease (GBD) found that inadequate surgical provision accounts for 77.2 million avertable disability-adjusted life years each year (Lopez et al, 2006). The GBD emphasises the relative cost-effectiveness of investing in surgical care in comparison to other fields of healthcare, such as infectious diseases. The specific challenges for global surgery can be conceptualised as access, quality and workforce, as described below.

Access

There is a huge unmet need for surgery in poorer resourced health systems: only 6% of surgical cases in 2015 were undertaken in low and middle income countries and it is estimated that 143 million additional surgical procedures are needed each year to save lives and prevent disability (Meara et al, 2015).

There are also significant delays in accessing surgery. These can be conceptualised using the three-delay model (Meara et al, 2015): delays in seeking, accessing and receiving care. Delays in seeking care can arise from 'financial and geographic restrictions, cultural beliefs, poor education, a history of being disconnected from formal health systems, and low awareness of available services or low confidence in those services' (Meara et al, 2015). Delays in accessing care include difficulties reaching dispersed surgical centres via inadequate transport systems. Delays in receiving care are multifactorial, but include lack of workforce (see below) and resources; for example, high income countries have ten times as many operating theatres per person than low and middle income countries and there are similar discrepancies in access to utilities such as electricity, oxygen and running water (Meara et al, 2015).

Cumulative delays affect patients both physically and financially. For example, delays in seeking medical care through consulting alternative, cheaper options first (such as a traditional healer) could lead to disease progression by the time formal healthcare is sought. Subsequently, more extensive surgery and a prolonged postoperative stay may be necessary. Being unable to afford this and seeking to fundraise would further delay the provision of care, affecting families and communities.

Quality

Of the 8.6 million global deaths amenable to healthcare (ie deaths resulting from use of poor-quality services and deaths resulting from non-use of health services), nearly two thirds result from poor-quality care, as opposed to limited use of or access to healthcare (Kruk et al, 2018). The African Surgical Outcomes Study found that the risk of death after surgery in Africa was approximately twice that in high income countries, despite similar intraoperative complication rates and a lower patient risk profile (Biccard et al, 2018). The inequities in outcomes are even sharper for obstetric surgery (which can represent approximately 50% of surgical workload in resource-poor settings), with the mortality rates after caesarean section being 50 times higher in Africa than in high income (Bishop et al, 2019). Similar differences are seen in outcomes from paediatric (Torborg et al, 2019) and neonatal surgery (Withers et al, 2021).

The reasons for these outcomes are multifactorial but the African Surgical Outcomes Study concluded that 'failure to rescue' (death following a perioperative complication) is a significant contributor to deaths after surgery for adults (Biccard et al, 2018). Fragmented care pathways and inefficient interdisciplinary communication can result in delayed escalation and ultimately greater morbidity and higher mortality (Bedwell et al, 2022).

The financial impacts of inadequate surgical provision are stark and felt by patients, providers and the public. Each year, it is estimated that catastrophic health expenditure (when healthcare costs exceed 10% of total household expenditure) is incurred by 33 million people paying for surgery, plus 48 million people paying for the non-medical costs of accessing surgery.

Workforce

A key barrier to both access and quality of surgical care in poorer resourced health systems is the lack of skilled workforce. Higher income countries have approximately 100 times as many surgeons as do low-income countries (Meara et al, 2015). The staffing shortage extends beyond surgeons; the Lancet Commission for Global Surgery identified a minimum staffing level of 20 surgeons, anaesthetists or obstetricians per 100 000 population, below which perioperative mortality rose dramatically. To meet this threshold in resource-poor countries, it is estimated that 2.2 million more surgeons, anaesthetists or obstetricians are needed. However, challenges remain with retaining skilled healthcare professionals, not least as a result of 'brain drain' to high income settings, often driven by poor remuneration, a stretched workforce and challenging working conditions. For example, there are only 5% of the recommended number of physician anaesthetists in east, central and southern Africa (Asingei et al, 2023).

Challenges and opportunities for perioperative medicine to contribute to global surgery

The following tools of perioperative medicine offer opportunities to address the challenges faced by global surgery described above.

Care pathways

As discussed above, improved care quality must develop alongside universal healthcare coverage to deliver better health outcomes (National Academies of Sciences, Engineering, and Medicine, 2018). Care pathways are one method of addressing the chasm between healthcare coverage and quality. They represent multidisciplinary plans to optimise clinical practice, outcomes and efficiency (Centre for Perioperative Care, 2023). Key to the success of care pathways is adherence to their various components, which is often a barrier even in high income countries (Day et al, 2015).

There is limited literature describing perioperative care pathways in poorer resourced health systems, with the majority of these being low quality from single-site tertiary hospitals (Patel et al, 2022). Such facilities often have greater resources and staffing, making it difficult to extrapolate findings to small remote hospitals, which comprise the majority of settings in lower income countries. Nevertheless, international guidelines, particularly those for enhanced recovery, continue to be adapted for implementation in resource-limited

settings, with a focus on primary and secondary hospitals, given the greater population coverage such pathways could achieve (Oodit et al, 2022). Such care pathways currently focus on elective rather than emergency surgical care.

However, merely replicating care pathways from high income to lower income settings is unlikely to work because of contextual differences, such as resistance from local surgeons and anaesthetists regarding postoperative planning, differences in postoperative support care available in the community, or resource constraints inhibiting the use of certain drugs or surgical technologies (Patel et al, 2022). Adaptations may reflect differences in local patient populations (such as prevalence of infectious diseases), perioperative services (such as availability of minimally invasive surgery) or wider healthcare systems (including prehabilitation services). An example of a successful adaptation to local context involved the recognition of the role of families in providing perioperative care during paediatric cardiac surgical pathways in Pakistan, and the costs they incur when staying near hospitals (Akhtar et al, 2000).

Risk prediction

Preoperative risk prediction tools, such as the Surgical Outcome Risk Tool (Protopapa et al, 2014), now play a vital role in postoperative planning and enable patients to give informed consent through shared decision making (Shaw et al, 2023). However, the majority of these tools have been designed and validated for populations from higher income countries with different demographics and disease burdens than those of lower and middle income countries (Protopapa et al, 2014; American College of Surgeons, 2023; National Emergency Laparotomy Audit, 2023). Extrapolating to lower and middle income countries risks inaccurate risk stratification, invalidates consent and prompts unrealistic perioperative care planning. It is encouraging that new tools such as the Africa-specific African Surgical Outcomes Study surgical risk calculator, which has been validated to identify high-risk patients preoperatively (Kluyts et al, 2018). However, even within multinational datasets in Africa, factors such as war, famine, seasonal weather, workforce and case-mix lead to huge variations between countries (Biccard et al, 2018). Furthermore, data from these countries often centre around large tertiary hospitals, again demonstrating the difficulties with generalisability to remote hospitals. Although questions remain regarding whether the African Surgical Outcomes Study surgical risk calculator can be generalised to an entire continent, it is the first such perioperative medicine tool of its kind. Research into other low and middle income continents, such as Asia, could reap benefits from cohesive perioperative care pathways.

Creating and validating such tools is a daunting task given the limitations of accurate data collection in lower and middle income countries. However, use of and compliance with such tools is equally challenging considering the additional workload placed on an already stretched medical workforce. The concept that data collection be ‘work neutral’ often does not mimic reality and affects both quantity and quality of data collection (Vickery et al, 2021). Furthermore, theoretical models and interventions do not necessarily translate to reduced mortality, as demonstrated by the African Surgical Outcomes Study-2 intervention, which is discussed in more detail below (Vickery et al, 2021). Future work addressing preoperative risk tools in low and middle income countries must engage and empower local clinicians to increase the chance of successful implementation.

Data collection, research and quality improvement

Data collection is key to identifying gaps in perioperative care, designing interventions and monitoring their impacts (Kluyts and Biccard, 2021). Robust and accurate data registries are sparse in low and middle income countries, but are growing rapidly to address a lack of local context-specific data (Kifle et al, 2023). It is encouraging to see that nascent perioperative registries have been implemented in several low and middle income countries such as South Africa and Ethiopia (Smit et al, 2020; Network for Peri-operative Critical Care, 2021), in keeping with the stated goals of a recent research priority-setting exercise in Africa (Biccard and The African Peri-operative Research Group (APORG) Working Group, 2020). Furthermore, the Lancet Commission for Global Surgery suggested key indicators for perioperative services, which include measures of access, workforce, activity, mortality and costs (Meara et al, 2015). These indicators have been updated by an international expert consensus to support advocacy for improvement, comparisons between and within health

systems, and to reflect the evolution of countries' differential abilities to collect and/or use data (Davies et al, 2021).

Perioperative research is changing rapidly to describe and address the challenges in resource-poor settings. Large-scale collaborations between surgeons, anaesthetists and other specialties have delivered high impact observational and interventional studies on topics very relevant to low income settings, including prevention and treatment of wound infection, prevention of postoperative pneumonia, and the associations of structural characteristics of hospitals with patient outcomes after cancer surgery (The NIHR Global Health Research Unit on Global Surgery, 2023). Funders from high income countries have taken note and created high performing teams of researchers in both global surgery and perioperative care. These programmes seek to address:

- Structural issues, including the development of research capacity and leadership in low and middle income countries
- Engagement of local stakeholders in perioperative research
- Process issues, such as best methods of identifying deteriorating patients after surgery
- Improving management of maternal haemorrhage (APORG Caesarean Delivery Haemorrhage Group, 2022; National Institute for Health and Cancer Research, 2022).

Quality improvement is inherent to the perioperative medicine approach but delivering it successfully is difficult, especially in contexts with limited resources, as demonstrated by the pan-African African Surgical Outcomes Study-2, which failed to show a mortality benefit for targeted enhanced postoperative surveillance (ASOS-2 Investigators, 2021). A systematic review of surgical and perioperative quality improvement in sub-Saharan Africa concluded that there were few hospital-based studies of quality improvement, use of improvement and implementation methodologies remained low, and efficiency and equity were rarely measured domains of quality (Brima et al, 2022). However, there is evidence that quality improvement interventions can make significant improvements in perioperative settings in low and middle income countries (Jin et al, 2021). The Clean Cut programme enabled impressive improved compliance with infection prevention processes in Ethiopia (Forrester et al, 2021), the Global Capnography Project reported significant improvements in 'closing the capnography gap' in Malawi (Jooste et al, 2019), and the WHO Safer Surgery programme demonstrated a significant improvement and sustainability (Kim et al, 2015).

Workforce

Perioperative systems-level approaches pose potential solutions to address the workforce shortages described above. A key development has been the formulation of national surgical obstetric and anaesthetic plans to create actionable policy-level recommendations (Truché et al, 2020; Program in Global Surgery and Social Change, 2021). These plans reflect the multidisciplinary nature of surgical care, as emphasised by the perioperative medicine approach, typically focusing on recommended minimum levels of staffing for surgeons, anaesthetists and obstetricians, rather than individual clinical specialties.

Addressing the lack of healthcare professionals can involve training more staff. There are numerous ways to do this, for example anaesthesia providers can be trained via physician degree programmes, non-physician degree programmes, or higher diplomas (Bulamba et al, 2022). Education and training can also strengthen the existing workforce and facilitate 'task-sharing' between clinical specialties ('the rational redistribution of tasks among the health workforce team'), which is a critical strategy in low and middle income countries (Program in Global Surgery and Social Change, 2021). They can also enable 'task-shifting' (Federspiel et al, 2015), for example the use of non-physician anaesthesia providers (with proper training and support) to deliver services. Learning from these approaches is relevant to those high income countries (such as the UK) facing workforce shortages and contemplating greater reliance upon non-physician anaesthesia providers (Sellers et al, 2022).

Conclusions

This article has outlined some similar challenges that perioperative medicine and global surgery seek to address: unmet demand for surgery, insufficient workforce and variation in quality. Both approaches comprise clinical care, academic research and advocacy in their

Key points

- Perioperative medicine and global health are both seeking to reduce unmet surgical need, decrease variation in quality and systematically improve patient outcomes.
- Tools from perioperative medicine, such as care pathways, risk-prediction, research, data registries and quality improvement, may be adapted to global health contexts.
- Both fields require systems-level approaches to advocate for and address their key challenge, which is workforce shortages.

aim to influence policy making. Despite substantial differences in the contexts of these two disciplines, there are similarities in the problems they describe, and hence potential approaches to improvement, between the two contexts. These approaches comprise coordinated care pathways, use of risk prediction tools to inform decision making, data collection, research and quality improvement and system-level approaches to strengthen the perioperative workforce.

Application of perioperative medicine tools from high resource settings to lower resourced ones requires adaptation to be successful and locally valuable. Collaboration between the two disciplines will hopefully yield bidirectional learning as health systems from different contexts share solutions on how to improve perioperative care in the face of limited resources.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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