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Challenges in healthcare delivery in low- and middle-income countries

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Abstract
The Lancet Commission outlines a vision of universal access to safe emergency and essential surgery. Global disparities in perioperative outcomes are recognized, with resource-poor environments and a workforce crisis particularly challenging low- and middle-income countries (LMICs) to provide safe surgical and anaesthesia care. The coronavirus disease (COVID-19) pandemic placed an even greater strain on under-resourced and over-stretched healthcare systems. Bridging the gap to achieve universal access is a substantial undertaking and requires collaboration with high-income countries. Global partnerships are abundant and mutually beneficial, aiming to alleviate the workforce crisis, provide education, training and expertise and raise standards of care in host LMICs. Clinical, leadership and management experience gained in low-resource settings is valued by healthcare systems in high-income countries, acknowledged by curriculum for ‘developing world anaesthesia’. Further challenges to healthcare delivery, training and implementation of change are influenced by government policy, cultural traditions, expectations and work ethic. During the COVID-19 pandemic many partnerships were required to move online. The necessity of providing remote support has created its own set of challenges, while also providing novel opportunities for education and collaboration with the global health community. This article describes challenges through reflection on personal experience in Zambia.

Keywords
Anaesthesia; developing nations; low- to middle-income countries; Zambia

Royal College of Anaesthetists CPD Skills Framework: Healthcare management

Introduction
The Lancet Commission on Global Surgery, 2015, quantified the extensive, growing, unmet surgical burden of disease, recognizing that surgical management of surgical conditions prevents disability and death and proves cost-effective. They published recommendations for universal access to safe, affordable perioperative care by 2030. Concurrently, the focus of global healthcare initiatives progressed from population- or disease-specific Millennium Development Goals (MDG) to Sustainable Development Goals (SDG) with a focus on improving healthcare for all by investing in anaesthesia and surgical care.

The vision of ‘universal access’ is essential and emergency surgical and anaesthesia care (EESC) reachable within 2 hours by populations throughout the world. The capability of healthcare facilities to perform ‘Bellwether procedures’ (laparotomy, caesarian section and compound fracture fixation) is an indicator that EESC is achieved.

Global disparities underpin challenges to achieving this:
- 5 billion of the world’s 7 billion population cannot access safe, affordable surgical and anaesthesia care.
- 75% of operations worldwide are performed in the world’s wealthiest one-third of countries; 3.5% are performed in the poorest one-third.
- resource maldistribution exists between and within countries, especially low- and middle-income countries (LMICs).
- surgical workforce density and skill is insufficient to safely meet surgical demand in LMICs.
- anaesthetic-related mortality is significantly higher in LMICs, figures as high as 1 in 150 cases in parts of Africa.

The global community has collective responsibility for achieving universal access. Global healthcare partnerships (GHP) have expanded opportunities for collaboration between high-income countries (HICs) and LMICs through voluntary and funded projects. GHPs that have maintained their links throughout the coronavirus disease (COVID-19) pandemic, albeit remotely, have had a unique opportunity to expand the benefits of their collaboration, to include advocacy for universal vaccination and raising funds for provision of personal protective equipment (PPE), essential drugs and equipment.

Health Education England recognizes benefits to the NHS of experience gained in LMICs and the Royal College of
Zambia

Zambia is an LMIC in southern Africa. University Teaching Hospital (UTH) in the capital city, Lusaka, is the tertiary healthcare centre providing adult, maternal and paediatric subspecialty medical, surgical, emergency and intensive care.

UTH’s ambitions include expansion of specialized clinical services and better accessibility to Zambians, negating the necessity and costs of transfer for treatments abroad. Whilst these ambitions are commendable, the government recognizes development of specialist skills requires a significant financial commitment and necessitates temporary loss of staff to undertake training in other countries. The strain on human resources is mitigated by UTH’s engagement in GHP, hosting external faculty to train local staff in a cost-effective, culturally sensitive and sustainable way.

Zambia Anaesthetic Development Project (ZADP) (https://zadp.org)

ZADP was established in 2012 as a partnership between UTH and the Association of Anaesthetists of Great Britain and Ireland (AAGBI) to support the new physician anaesthetist training program. ZADP competitively recruits fellows from countries with specialist programmes (largely the UK) to work alongside Zambian colleagues. This partnership is mutually beneficial and encourages bi-directional learning, with guest trainees gaining experience in resource-limited environments, developing lifelong skills including teaching, quality improvement, leadership and management, whilst the host department is supported with education, mentorship, development of governance activities, e.g. audit, morbidity and mortality review and advocacy for improving safety and standards of perioperative care. In 2019, ZADP expanded to support a second anaesthetic department at Ndola Teaching Hospital in the Copperbelt Province.

In 2020, at the start of the COVID-19 pandemic, in accordance with government advice, all ZADP fellows were required to leave Zambia. The partnership turned to online video-conferencing to continue to support anaesthetic training, while maintaining support for locally-led quality improvement projects and clinical governance. The ZADP partnership led fundraising campaigns, supplying every anaesthetic provider with PPE and increasing governance. The ZADP partnership led fundraising campaigns, supporting locally-led quality improvement projects and clinical governance. The ZADP partnership led fundraising campaigns, supplying every anaesthetic provider with PPE and increasing governance. The ZADP partnership led fundraising campaigns, supplying every anaesthetic provider with PPE and increasing governance. The ZADP partnership led fundraising campaigns, supplying every anaesthetic provider with PPE and increasing governance.

The wider challenges of healthcare delivery in LMICs are outlined below.

Conduct of surgery and anaesthesia

Lack of resources underpins challenges in healthcare delivery in LMICs. Conduct of surgery and anaesthesia is influenced by workforce, equipment and infrastructure.

Surgical workforce

The specialist surgical workforce is measured as the density of surgeons, obstetricians or anaesthetists (SOA) per 100,000 population.1 Disparities between LMICs and HICs are evident;
Equipment and infrastructure

The working environment must be suitably equipped to enable safe delivery of care throughout the operative period. In LMICs, provision of safe perioperative care is challenged by:

- unreliable supplies, e.g. electricity, water, oxygen, medications, equipment, blood bank
- unreliable functioning of equipment, e.g. infrequent equipment calibration, maintenance and repair, re-use of disposable items
- inadequate post-anaesthetic care, e.g. recovery capacity, monitoring, intensive care beds
- hindered hygiene and infection-control practices.

These challenges were further exposed during the COVID-19 pandemic. While the equipment supplying oxygen was feared close to failing to meet demands in HICs, in Zambia the deficit cost lives. Managing a respiratory pandemic with insufficient oxygen is an insurmountable challenge. As a result of disrupted supply chains, essential drugs like ketamine, muscle relaxants and opioids continue to have limited and variable availability.

Safe perioperative care is achievable with limited resources by using standardized anaesthetic techniques, a concise set of drugs and equipment, providers trained to a minimum standard that ensures competence in general, regional and local anaesthesia and management of complications. Medecins Sans Frontiers analysed their anaesthesia care in resource-limited settings over 6 years. Outcomes for more than 75,000 cases suggests EESC can be performed safely with a simple toolkit and adherence to strict guidelines and protocols. LMICs adopting this approach would empower their anaesthetists to achieve a safe standard of care.

In the wider context of infrastructure, patients in LMICs face multiple impediments to accessing healthcare, outlined in the ‘3 delay framework’:

- delay in seeking care, e.g. financial, geographical, educational, cultural reasons
- delay in reaching care, e.g. transport, distance to facility
- delay in receiving care, e.g. hospital capacity, skills, resources.

First-level hospitals often function with fewer specialist staff and resources, making them unsuitable for management of complex cases. Necessary onward referral to tertiary centres leads to overcrowding, exceeding intended capacity by 200–300%. Acute overburden reduces ability to proceed with elective procedures resulting in advancing pathologies and chronic conditions, which present additional complexities to surgeons and anaesthetists and require longer hospital stays with poorer patient outcomes.

Universal access for all endeavours to provide Bellwether procedures in a facility reachable within 2 hours by the patient; these delays must be addressed to optimize conduct and outcomes for EESC.

Training and education

Roles of the anaesthetist encompass treatment throughout the perioperative period including provision of anaesthesia, analgesia, management of physiological disturbance and resuscitation in critical illness. The knowledge, skills, procedural training and clinical experience underpinning practice must be sufficient to ensure competence and optimal patient outcomes. In HICs, the anaesthetist is understood to have an advanced level of specialist medical training, recognized as an advocate of patient safety and is a respected leader in healthcare. However, in LMICs physician anaesthetists are a scarce resource and a robust curriculum, training and accreditation in anaesthesia are a relatively new invention.

The international anaesthetic community delivers training and education through:

- global partnerships, e.g. ZADP, World Federation of Societies of Anaesthesia (WFSA) fellowships
- courses, e.g. AAGBI ‘Safe Anaesthesia From Education’ (SAFE) courses in obstetric and paediatric anaesthesia, including training trainers, have trained more than 3000 anaesthetic providers in 30 LMICs
- online resources, e.g. ‘eSAFE anaesthesia’ (www.e-safe-anaesthesia.org), developed by RCOA, AABGI and WFSA provides e-learning and continued professional development for providers in resource-limited settings.

At the start of the pandemic, ZADP moved to online video-conferencing to maintain its support of the anaesthetic training program in Zambia. Since then a remote fellowship has been launched and the last year has seen the appointment of seven remote fellows. There is a weekly rota of junior and senior teaching sessions, and weekly alternate M&M and journal club meetings. Both Zambian and external trainees and consultants have been involved with facilitating the sessions, as well as past in-country fellows. The inception of virtual attendance at conferences has been an unexpected benefit of the pandemic. Thanks to this, Zambian trainees have attended and presented posters at international conferences without the need to travel.

The World Anaesthesia Society (WAS) collates projects and achievements of many organizations contributing globally to education, training and improving standards of care. Their conferences gather the international anaesthetic community together. During the pandemic the World Federation of Societies of Anaesthesiologists (WFSA), put together a online collection of guidance on managing COVID-19, including specific advice for low-resource settings. https://wfsahq.org/resources/covid-19/

The WFSA is a collaboration of international societies of anaesthesia that produces educational resources and guidelines for patient safety, innovation and research. Publication of their newsletter disseminates global news, updates and objectives. They also fund overseas fellowships for trainees from LMICs. WAS and WFSA are an information hub for global anaesthesia: www.worldanaesthesia.uk, www.wfsahq.org

Quality improvement and implementation of change

Although global improvements are outlined in SDGs, specific targets and speed of progress will be heterogeneous between countries. Healthcare needs of populations must be understood for implementation of change to be responsible and effective. Quality improvement projects are most effective and sustained with local leadership, management and accountability. Informal leadership, unstructured management, ineffective allocation and
inefficient use of resources, unclear or unachievable goals, dysfunctional relationships and communication between health-care agencies are common barriers to collaboration and transformation. It is key that international partners understand clinical context, respect autonomy and empower local institutions to develop practice relevant to their environment. Expectation and translocation of standards, practice and protocols underpinning healthcare in HICs is presumptuous, paternalistic and not appropriate in LMICs. The focus of quality improvement should remain relevant to providing the safest care achievable.

In accordance with SDG 3, Zambia aims to decrease their current neonatal mortality rate (NMR) of 24 per 1000 live births. The MoH strategy involves neonatal resuscitation training and equipment distribution nationwide. A quality improvement project at UTH commenced in 2017, with a multidisciplinary team of neonatologists, paediatricians, anaesthetists, nurses and midwives pursuing these aims:

- reduction in NMR to <12 per 1000 live births by 2021
- train 80% of doctors and midwives in neonatal resuscitation
- implement guidelines: 2015 Resuscitation Council UK algorithm
- audit and supply of equipment.

More than 320 healthcare providers have attended neonatal resuscitation training courses and 12 have trained as trainers. Meeting project aims necessitates ongoing outreach training in first level facilities, funding regular courses and equipment procurement.

Without an in-country presence, ZADP was entirely guided by the Zambian anaesthetic departments of Ndola and Lusaka as to what support was required for quality improvement projects during the pandemic. Projects which received remote support included the Regional Anaesthesia Project and the Take a Deep Breath Campaign. Despite the challenges of the past two years, the Regional Anaesthesia Project has carried out initial audits of practice, which are to be presented at an international conference, and are rolling out a series of educational programs to increase awareness of and familiarity with regional anaesthesia.

The take a Deep Breath Campaign has not only seen the provision of PPE to every anaesthetic provider in Zambia, but also the donation of 52 oxygen concentrators, 200 pulse oximeters and over 800 oxygen delivery devices. This year a series of educational videos have been sent out to every hospital in Zambia, to improve the way in which respiratory failure is managed and implement a long-lasting positive change for the future.

Safety and security
Clinical experience in LMICs presents safety and security concerns to the visiting anaesthetist that act as deterrents for some. Considerations are:

- health, e.g. communicable diseases (malaria, HIV, hepatitis, tuberculosis, cholera, Ebola, coronavirus, Zika virus)
- insurance, e.g. travel and medical insurance policies should cover personal belongings, healthcare and repatriation
- road safety, e.g. drink driving, poor road infrastructure and vehicle maintenance mean increase risk of injury from road traffic accidents
- communication, e.g. mobile phone, internet access
- accommodation, e.g. location, house sharing
- COVID-19 has highlighted how countries can suddenly enter periods of ‘lock-down’, with associated travel bans preventing immediate departure. ‘Lock-downs’ can also have an effect on all the above considerations.

Research about the country to be visited, foreign office and medical advice obtained prior to travel allows education and evaluation of risks, relevant vaccinations and opportunity to consider these issues.

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