MENTORS IN ORTHOPEDICS

GLOBAL ORTHOPAEDICS - OUR LEGACY FOR THE FUTURE?

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AUTHORS

Alberto Gregori - Hairmyres Hospital, East Kilbride, Scotland
Patricia O'Connor - Glasgow, Scotland

SUMMARY

Background: The COVID-19 pandemic underscored global health disparities and the critical shortage of surgical services in low- and middle-income countries (LMICs). Approximately five billion individuals lack access to safe, timely surgical care, resulting in an estimated 20 million annual deaths and 77 million lost disability-adjusted life years (DALYs). Orthopedic conditions, including neglected trauma, infection, and pediatric pathologies, represent a significant portion of this unmet surgical need.

Objective: This review examines the current state of orthopedic service provision in LMICs, evaluates the economic and clinical barriers to care, and outlines strategies for sustainable surgical education, equipment procurement, and international collaboration.

Key Points: Surgical deficits in LMICs lead to profound morbidity, such as limb loss from delayed open fracture management. Economic projections suggest that achieving universal access requires 2.2 million additional healthcare workers, yet the cost is offset by preventing trillions in lost economic output. Effective service delivery models prioritize local capacity building through organizations like the College of Surgeons of East, Central and Southern Africa (COSECSA). Clinical practice in resource-limited settings necessitates adapting techniques, such as using percutaneous wires or specialized intramedullary systems like the SIGN nail, rather than high-cost, maintenance-heavy implants. Successful interventions emphasize "Train the Trainer" programs, virtual mentorship via mobile telecommunications, and the donation of robust, environment-specific equipment. Ethical considerations remain paramount, focusing on informed consent and the pillars of beneficence and non-maleficence within austere environments.

Conclusion: Addressing the global burden of musculoskeletal disease requires a shift from short-term surgical camps to sustainable, education-focused partnerships. Integrating technology for virtual support and prioritizing resource-appropriate surgical techniques are essential for improving orthopedic outcomes in LMICs.

KEYWORDS

Orthopedic Procedures; Developing Countries; Health Services Accessibility; Fractures, Open; Education, Medical, Continuing

The overwhelming impact of the COVID-19 Pandemic has been to demonstrate to the world that we are all fragile human beings. Indeed, despite our perceived evolution and societal sophistication we are at risk of succumbing to an infectious disease much like our forefathers throughout history. We are battling a brutal opponent that targets and levels 'mankind' failing to recognise differences of geography, culture, power or wealth. It is no longer acceptable to retreat to our national and personal interest islands ignoring our global interdependence. We must recognise the needs of those outwith our national (more fortunate) 'bubbles' and extend health policies and resources to include those areas of the world where health care needs are acute and profound and where poverty supervenes. The Pandemic has highlighted not only the plight of LMIC countries (Low and Lower Middle Income Countries) from the COVID-19 perspective but also the ongoing daily health care crises facing millions of people worldwide. (Fig 1). It is time to think 'globally'.

Fig.1 Covid rules Mzuzu Cental Hospital gate Malawi

In the past we have concentrated global health care on specific diseases such as TB, HIV and Malaria with 1.20, 1.46 and 1.17 million deaths per year respectively. However, the Lancet Commission (www.lancetglobalsurgery.org) highlights that 20 million deaths a year and significant morbidity arose from lack of surgical care in LMIC countries along with about 77 million lost Disability Adjusted life years (DALYs). The scale of the problem is staggering: 5 billion people lacked access to safe, timely surgical care affecting 90% of the population of LMIC countries. (Fig 2)

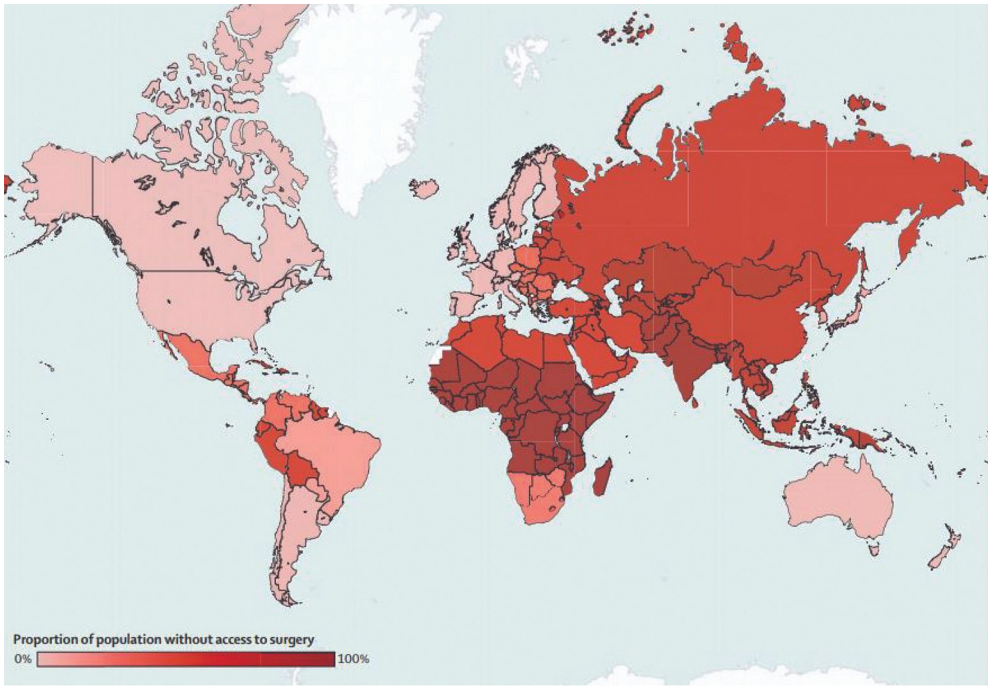

Fig 2 - Proportion of population without access to surgery (Lancet Global Surgery 2030)

Issues encompassed delays in seeking care, in reaching care and in receiving care. Even if able to reach a hospital facility it was not certain that it could provide suitable care for Bellwether index procedures such as caesarean section, laparotomy and treatment of open fractures. If surviving the surgical emergency, patients often carried the subsequent burden of morbidity such as cerebral palsy in delayed obstetric care, adhesive complications in delayed laparotomy and limb loss or gross dysfunction in delayed open fracture management. (Fig 3). Today, surgery still remains a neglected component of health care in the LMIC world.

Fig 3 - Delayed Open tibial Fracture

ECONOMIC CONSEQUENCES

Additionally, even successful surgery often comes with a catastrophic financial outcome. The World Bank estimates that 33 million people each year face financial ruin as a result of seeking surgical care with another 48 million facing ruin as a result of accessing it (travel and other costs). The Lancet's Global Surgery 2030 Report (1) estimated that we need an extra 2.2 million healthcare staff to achieve their goal of affordable accessible surgery within 2 hours for 80% of the world's population at a cost of over US $ 420 million per year but this was balanced against an estimated total loss of US $ 12.3 trillion in terms of lost output and disability costs over 2015-30. The goal remains to achieve surgery as an "indivisible indispensable part of global health care" and as we know safe anaesthesia and emergency care goes hand in hand with safe surgery and is included in this discussion. The Commission outlined a goal of delivering 5000 procedures per 100,000 of the population by 2030. There is a powerful economic argument for governments to enhance surgical service provision and global health organisations need to measure surgical care as a healthcare indicator. The international community also needs to achieve funding to alleviate this underrecognised aspect of poverty and we need to inform the public as to this urgent need.

As an orthopaedic community we are well equipped to address the need to provide and support orthopaedic surgical care provision in LMIC countries and we must be cognisant of the disparity in available musculoskeletal care throughout the world. We can do this by teaching and service commitment. These are the aims of organisations such as World Orthopaedic Concern UK (🔗 www.wocuk.org), Emergency! (🔗 https://en.emergency.it), Médecins Du Monde (🔗 https://www.medecinsdumonde.org) and Australian Doctors for Africa (ADFA) (🔗 https://ausdocafrica.org) to name but a few. This review of orthopaedic service provision in LMIC countries looks at examples which cover only a small number of successful projects throughout the world, highlighting many different approaches. We also discuss particularly important aspects of providing these, though we would refer the reader to the excellent and comprehensive Lancet Global Surgery 2030 report and the DCP3 World Bank Essential Surgery texts (2).

Today there is a growing thriving orthopaedic community in many of these countries and the recent COSECSA (College of Surgeons of East Central and Southern Africa) Orthopaedic FCS exams highlighted the quality of Orthopaedic training now available in the region.

SERVICE PROVISION

The lack of orthopaedic service provision remains a huge challenge throughout LMIC countries. Many Orthopaedic Non Governmental Organisations will help provide staff, teams or visitors to help address this need. Some will use local facilities either as they are, or help enhance them by providing equipment or helping refurbish units. Whilst this is a good short term solution it cannot enhance sustainable provision of orthopaedic care as we have seen during the present COVID-19 Pandemic. It remains the fall back however, until we are able to increase local training and capacity. Surgical camp provision works best in cooperation with local staff helping to address local needs and priorities rather than perceived needs. There must be an effective system of follow up in place with availability of advice for any issues and a fallback plan for dealing with complications. Appropriate documentation must be provided that will work locally often in "health passports" carried by the patient. (Fig 4)

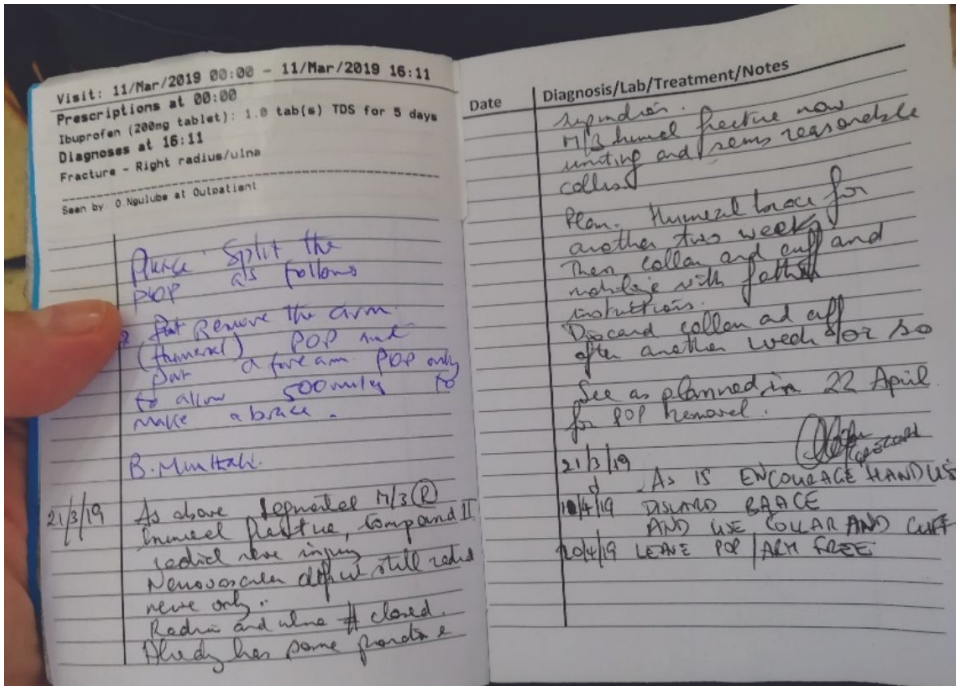

Fig 4 - Health Passport

We need to remember that there may be very little support for our patient when we leave with little local expertise, physiotherapy or care for any complication. Recent massive improvements in mobile telecommunications throughout LMIC countries have enabled significant advances in delivery of specialist care, and clinical cases can be reviewed virtually on platforms such as WhatsApp both pre and post operatively but also for advice if complications arise.

ORTHOPAEDIC CLINICAL OFFICERS AND OTHER PARAMEDICAL STAFF

As noted in the Global Surgery 2030 report much specialist orthopaedic care can be delivered by appropriately trained Clinical Officers or medical assistants supported by fully trained specialists. Many LMIC countries rely on these paramedical grades to continue at least a basic service in district hospitals but there is no doubt some can provide a very high standard of care if correctly trained and supported. This cadre of specialists will undoubtedly form part of the solution for the future but they too will require training, development and an opportunity to work in theatres. It's noteworthy this model may well extend to high income countries as pressures on their health care systems increase and they might look to the less developed world for lessons in future.

APPROPRIATE SURGERY

Whilst the spectrum of orthopaedic pathology is as wide as in first world countries the pathology is usually much more advanced with a preponderance of paediatric pathology, infection and neglected trauma. Local deficiencies with theatre sterility, lighting, electricity, X-ray and surgical supplies will dictate that techniques need to be tailored to the local circumstances. Percutaneous techniques with wires for many upper limb fractures are as good as locked plates but significantly cheaper and safer. (Fig 5)

Fig 5 - Simple Percutaneous ORIF

Older techniques should be borne in mind and are often more suitable in difficult theatre circumstances for example a Rush nail or Steinmann pins and plaster for some fractures. Central hospitals may be a suitable place to utilise external fixator frames for deformity correction but frequently open surgical correction is best suited for the family and patient that live in remote rural areas. Many units are not able to safely provide for arthroplasty surgery but will sometimes host teams that want to provide this. Experience has shown that arthroplasty is best reserved for larger hospitals with adequate infrastructure and trainees who benefit in the long term from this exposure (3).

EXAMS

The training programmes developed over the last 40 years throughout LMIC countries now see trainees completing training and being examined to standards set regionally and supported by international surgical colleges and orthopaedic associations. The Fellowship of the Colleges of Surgeons of East, Central and Southern Africa (🔗 www.cosecsa.org) is the hallmark of completion of surgical training and the standard of candidates now bears witness to the success of training. External examiners from Europe, Asia and North America help externally validate the standards of these exams and again require enthusiastic volunteers to participate in the exam diets as external examiners. The last diets were conducted in a hybrid manner using Zoom and WhatsApp for external examiners who could not travel.

TEACHING

Many units still struggle with staff shortages and a lack of expertise in teaching. They have to cope with heavy service demands that have to be balanced against the need to train, a difficulty we in the west are all too familiar with. These units welcome support in bedside teaching as well as courses and support in delivering audit,

research and grant applications. There are many opportunities to help either virtually or in person with short 2 week visits. Training the Trainer courses have been welcomed by senior LMIC staff who relish the opportunity to gain an insight into teaching methodology. (Fig 6)

Fig 6 - Theatre teaching

EQUIPMENT PROVISION

In our desire to help it seems natural to think about donating surplus equipment to a needy cause. More often than not these donations are of little value. This is especially the case with high tech donations. For example, there is little value in donating a set of Hip resurfacing instruments to a remote Mission hospital or a discarded high tech anaesthesia machine which requires piped oxygen, only has vaporisers for unavailable agents and no possibility of obtaining spares or maintenance. Air driven Power tools are useless if there is no provision for compressed gases. Date expired drugs are also of little value and create practical and ethical issues that are hard to deal with such as safety and disposal issues.

There are organisations such as MedAid (🔗 www.medaid.org.uk) that provide suitable rugged, simple and easily maintained equipment for use in these difficult environments. They understand the lack of suitable maintenance provision and poor supply of spare parts and can advise appropriately based on long experience in the sector. Anaesthetic equipment needs to be robust and suitable for use in environments without piped gases, access to modern volatile agents and unreliable power supplies and maintenance (🔗 http://www.diamedica.co.uk).

There are innovations that have been designed specifically for use in LMIC environments such as the Canadian Arbutus Drill (🔗 https://arbutusmedical.com) and the SIGN Nail (🔗 https://www.signfracturecare.org) and these have proved invaluable additions to our LMIC surgical travelling toolbox. (Fig 7) Teams travelling for work in LMIC countries can help direct which donations and equipment are suitable and also help in providing suitable training.

Fig 7 - Using Arbutus Drill and SIGN Nail

ADVISORY ROLE

With experience in working in LMIC environments comes the possibility of helping advise donors, NGOs and Government agencies as well as local health departments and ministries. WOCUK and others are able to help provide advice on many issues from Grants, Education and equipment provision to working with LMIC partners in curriculum development and grant applications.

RESEARCH AND AUDIT

A recurring request made by LMIC trainees is for help with the difficult task of completing audits, presentations and papers. A successful aspect of twinning departments has been the cooperation and mentorship between Ethiopian and UK trainees helping them to deliver completed projects, audits and publications. More mature twinnings have also involved short visiting fellowships to help further specialty interests. It is rare that LMIC trainees will benefit from long periods of training in the west. In recognition of this many longer fellowships are to large academic units in the region where there is more likely to be an exposure to similar pathology and resource settings.

INDUSTRY

The role of the Orthopaedic industry needs to be revisited in relationship to LMIC countries. What is suitable for sale in many developed countries may be difficult to support in countries with a less developed orthopaedic industry support infrastructure and costs become prohibitively high when factoring agents and importation costs

in comparison to Europe for example. More importantly the distribution of environment specific and resource conserving implant solutions should be the norm. A good example of this is closed intramedullary nailing systems where 3rd generation titanium nails are being sold into units that can poorly afford them and yet there is a cheaper more sustainable alternative available in the companies' own catalogs or from elsewhere such as the SIGN nail. The desire to have the best available after a company sponsored course may also change perceptions as to what to buy, resulting again in the diversion of meagre resources from achieving the greatest benefit.

Industry can help by ensuring that 1st generation products that are still excellent performers but perhaps less financially lucrative are still available in the LMIC field. This includes cemented total hip replacements which have a valuable role in LMIC orthopaedic care especially for avascular necrosis and generic internal fixation systems. The same applies to streamlining instrumentation to avoid unnecessary costs. Larry Dorr had long argued that the Orthopaedic industry should develop and distribute a low cost hip and knee arthroplasty option for use in poorer countries but little has been done so far in this respect. Surely they as well as ourselves, have a moral responsibility to be involved?

ETHICS

The Ethical aspects of volunteering merit an article in themselves. We need to respect the pillars of Medical Ethics as described by Pellegrino (4), autonomy, non-maleficence, beneficence and justice. This will cover such aspects as complying with local professional registrations and being properly aware of consent issues not only for surgery but also photography and ensuring that our standards of care translate from our normal home environment to that in our temporary LMIC theatre of work. We should still obtain proper consent and document this as best able. This requires patience and usually the use of interpreters as most patients will not speak or understand English nor other European languages only speaking their local language. It is good practice to reflect on what we do and ask if it is acceptable. Circumstances may mean a very different balance between non maleficence and beneficence when this may be the only chance a patient has for an improved life, despite the increased risks of surgery in a LMIC resource poor environment.

VOLUNTEERING AND TRAINING: HOW TO PREPARE AND HOW TO TAKE THE PLUNGE

Many orthopaedic and other colleagues will ask "how can I get involved?" What do I need to do? A lot will depend on what stage the volunteer is at. Trainees can gain much from sharing with their LMIC counterparts, especially by mentorship and teaching and this input is highly valued by them. It is usually inappropriate for the trainee to undertake much service provision in most circumstances, particularly in short visits.

Fellowships differ, as often the trainee is seen as part of the department and is expected to contribute to both service and teaching activity.

For specialists however things are different as service may well be a part of their gift as well as teaching. It is worth remembering that in many of our home practices we have become experts or super specialists in our field, working in a very supported silo of high level anaesthetists, radiologists, physiotherapists and other staff in state of the art clean operating theatre along with an Orthopaedic Industry that is able to support us with the latest and best technology. When we think "Oh, I'd like to go and help in Sub-Saharan Africa, I'd like to work in Papua New Guinea..." we need to prepare for what to expect. There are some valuable assets on the internet which can set the scene for us

(https://vimeo.com/431384067) as we do need to prepare for a culture "jolt". We need to relearn adaptability to shift from one environment to another though we probably had these skills in the past as young surgeons though it is likely that these skills have become blunted with time and specialisation.

Many incredibly gifted and able surgeons struggle to manage when faced with the reality of a different, harsh bewildering and unforgiving environment. It can be extremely difficult, because they haven't been prepared for it. Organisations, such as World Orthopaedic Concern, MSF, Médecins du Monde and others, have a duty to prepare people who want to volunteer, in order that they can do their best and stay safe. There are a number of courses available which may be of help but are not mandatory (www.rcseng.ac.uk/education-and-exams/courses/search/surgical-training-for-austere-environments-stae). We know from experience that good preparation and previous travel into similar countries will undoubtedly help. The most important thing however is that if possible first trips should always be accompanied with a colleague experienced in the region. Last but not least an abundance of patience, enthusiasm, determination, humility and a sense of humour will also take the newby volunteer a long way.

CONCLUSION

Becoming involved in some way yields not only benefits to society but also provides lifechanging personal benefits to both patients and the surgeon. It is well established that there are also benefits to the home unit or hospital as staff become more resilient and motivated. Not every clinician needs to visit a LMIC country as technology now allows us to link up when convenient and provide virtual support.

We hope that this article will inspire you to take an interest and take the first steps to contributing to the Global Orthopaedic Community. (Fig 8)

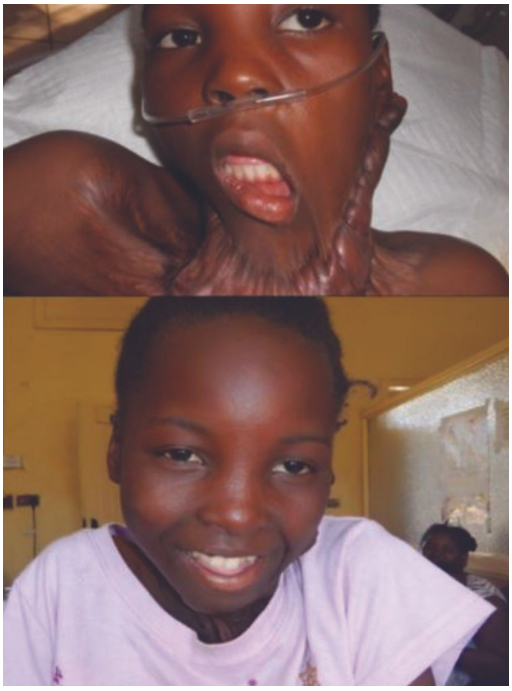

Fig 8 - Before and after release burns contracture

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