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Cooperation in Surgery of the 21st Century☆

José Gil Martínez, José Manuel Rodríguez González, Pascual Parrilla Paricio*

Servicio de Cirugía, Hospital Clínico Universitario Virgen de la Arrixaca, Murcia, Spain

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ABSTRACT

The need for healthcare cooperation in low- and middle-income countries is known and is implemented day by day. However, the surgical sanitary assistance in these countries in the 21st century is very controversial, as it is still below desirable levels and entails complex solutions. On the other hand, the number of surgeons seeking to get involved is increasing progressively. We analyze the causes of the low levels of medical assistance, such as the lack of qualified personnel, the brain drain of surgeons, healthcare costs or the lack of quantified needs. Opportunities for improvement, such as institutional twinning, short-term surgical missions or activities aimed at education, evaluation, evidence and training, are some of the possibilities proposed.

Cooperación en cirugía en el siglo XXI

Palabras clave:
Cooperación internacional
Voluntariado quirúrgico

RESUMEN

La necesidad de cooperación sanitaria en países de bajo desarrollo es conocida y se implementa día a día. Sin embargo, la asistencia sanitaria quirúrgica en estos países, en el siglo XXI, es más discutida, y se encuentra por debajo de niveles deseables y con soluciones más complejas. Por otra parte, el número de cirujanos que buscan implicarse aumenta progresivamente. Se analizan las causas que originan estos bajos niveles de asistencia, como la falta de personal cualificado, fuga de profesionales, coste de la asistencia o la falta de cuantificación de las necesidades. Las oportunidades de mejora, como el hermanamiento institucional, las misiones quirúrgicas de corta duración o la realización de acciones dirigidas a la educación, evaluación, evidencia y formación son algunas de las posibilidades propuestas.

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* *Corresponding author.*
E-mail address: pepegilmartinez@gmail.com (J. Gil Martínez).

Introduction

Health is a major concern worldwide. Many countries and organizations have been concerned enough to implement the Alma-Ata (1978) concept of ''health for all''. Three of the objectives of the millennium refer expressly to health, and there are several goals and mechanisms for implementing the objectives of the century to guarantee a healthy life and promote well-being for all at all ages.[1] Most of these international efforts refer to health in relation to communicable/non-communicable diseases, maternal and child mortality, or accidents, but very few refer to surgical care. Surgical care is an essential component in health. About 2000 million people do not have access to surgical services. A study by the World Bank Group argues that close to 1.5 million deaths per year would be avoided if the most basic surgical interventions in developed countries were available in other less developed countries.[2] According to the World Bank, the economy of countries is measured by GDP (gross national income or gross domestic product), rejecting the concept of more or less developed. Thus, low-income countries (LIC) are defined as those with a GDP per capita (calculated using the Atlas method of the World Bank) of $1005 or less in 2016; the lower-middle-income countries (LMIC) are those with a GDP per capita between $1006 and $3955; upper-middle-income economies (UMIC) are those with a GDP per capita between $3956 and $12,235; and high-income economies (HIC) are those with a GDP per capita of $12,236 or more.[3]

Although the number of surgical interventions has increased worldwide over the last decade, there continue to be great inequalities in access to them between low- and high-income countries, according to a study published in the Bulletin of the World Health Organization.[4] In 2012, some 312.9 million operations were carried out globally, an increase of 38% over the total from 2004. However, only 30% of the 2012 operations were performed in the 104 countries that spend less than $400 per capita per year on medical care, representing 5000 million people or 71% of the world's population.[4] While the most important increase in surgery between 2004 and 2012 occurred in very low-income countries, the discrepancies between rich and poor countries persisted. Therefore, the question arises of whether countries are providing the operations that people need most. The purpose of this paper is to analyze the problem of surgical care in LMIC and to define opportunities for improvement based on evidence, evaluation and training.

The Problem of Surgery in Lower-middle-income Countries

Countries with developing economies have not considered surgical care a priority in public healthcare. However, there are a large number of surgical conditions that cause poor health of the population and are a constant burden, with economic consequences and significant complications, some of which are potentially fatal.[5–7] In the book *Essential Surgery*, Debas identifies 44 fundamental surgical procedures from among all medical interventions in developing countries, many of which are among the most cost-effective and could be offered in primary care hospitals. Debas suggests that, ''Universal coverage of essential surgery (UCES) should be financed early on the path to universal health coverage.''[2]

Similarly, Jamison et al. indicate a large number of surgical interventions that are important for public healthcare,[8] especially in developing countries, where there is a huge accumulation of untreated surgical diseases,[9] and state: ''It turns out that the surgery that needs to be performed is not so difficult, not so expensive and would make a very obvious improvement.'' They estimate that between 6 and 7% of annual deaths in low- and middle-income countries could be avoided if a series of health services were guaranteed for the most basic surgery.

Although conditions treatable by surgery are still ''killers'' in LMIC, the main public healthcare financing entities have shown that they do not consider them a priority, even though, for example, more than 500,000 women die each year in childbirth. These deaths are largely attributable to an absence of surgical services or other means of stopping postpartum bleeding.[10] Also untreated in these countries are automobile and agricultural accidents, peritonitis, long bone fractures and even blindness.[11–13] It took decades to develop funding mechanisms for the prevention and care of AIDS. Tuberculosis, forgotten for decades, was declared a priority by the World Bank only after efforts were made to show that it was one of the leading causes of death for young adults around the world. The World Health Organization (WHO) and the Gates Foundation have announced plans to tackle malaria and other diseases of poverty. But, there is no global fund for surgery, and it is rare for foundations to be willing to support surgery as an important part of worldwide public healthcare.[14] Governments, WHO, financial agencies and international non-governmental organizations (NGO) are beginning to reevaluate the importance of surgical services in the development of countries and to prioritize the support, resources, training and labor required for such development.[15] The facts are surprising: each year, more people die due to the inability to access surgical care than due to AIDS, tuberculosis and malaria, combined.[16] The highest incidence comes from accidental trauma, tumors, obstetric complications, cataracts and glaucoma, perinatal conditions and congenital anomalies, male circumcision (prevention of HIV transmission) and a large group (19%) classified as ''Other'', which includes a variety of diagnoses, such as hernias, gallbladder disease, infections that require surgical attention, etc.[16,17]

Furthermore, in these countries, minor surgical ailments can often become life-threatening conditions if not treated. Meanwhile, congenital anomalies, such as cleft palate, remain untreated for life. Urgent and essential surgical care are slowly being recognized as essential elements to improve the provision of primary health care. Thus, in the WHO Health Report 2008, surgery was included for the first time within the sphere of primary health care.[15] The simple insertion of a word in an organizational outline was a great advancement that required years of continuous effort to achieve. This WHO collaboration materialized and gave priority to surgical care, actively participating in the Global Initiative for Emergency and Essential Surgical Care (GIEESC). A forum of surgical experts published the volume *Surgical Care at the District Hospital* (SCDH) in 7 languages and produced the tool kit for

Integrated Management for Emergency & Essential Surgical Care (IMEESC), with best-practice protocols (including disaster management) and multiple points of contact.

There are several reasons that may explain why conditions requiring surgery have been so overlooked in global health:

1. First of all, for decades international public healthcare has been dominated by concerns about communicable diseases, from smallpox to AIDS.[18] Surgical disease is usually classified as non-communicable, so it is not considered a public problem requiring public support and funds. Therefore, treatment of the surgical condition depends on the patient's finances.
2. Another reason for the lack of attention to surgery in global medical care is that there are now very few surgeons involved in the care of underprivileged patients. More fellow surgeons are needed to provide infrastructure reconstruction, personnel training and delivery of high-quality surgical treatment in the care of disadvantaged patients. It is estimated that sub-Saharan Africa has 24% of the global burden of disease but only 2% of the global supply of doctors.[19] There are fewer doctors per capita in Africa than in any other part of the world; surgeons are even scarcer and almost all work in urban enclaves. The story is the same in the poorer parts of Asia and Latin America. Despite the awareness and reference points generated by the development of the Millennium Development Goals,[20] most sub-Saharan Africa nations have a negative annual growth rate in the number of physicians compared to their rate of population growth.[19] In some sub-Saharan African nations, there are only 0.9 doctors per 1000 inhabitants, compared to 21 doctors per 1000 inhabitants in the United Kingdom and 28 per 1000 in the United States.[21] Policy makers and healthcare leaders in Rwanda, a nation with only 0.1 general surgeons per 100,000 inhabitants (compared with 6.4 per 100,000 in the United States), have recognized the negative socio-economic effects caused by such deficiencies, and they are committed to face these challenges.[22–24]
3. Furthermore, surgery is often a highly complex intervention that requires not only a surgeon but an anesthetist, operating room, autoclaves, sutures and other supplies, not to mention post-operative care and a blood bank. It is true that there is no surgical equivalent to a vaccination campaign or mosquito netting. In order to correctly conduct surgery, a significant investment in infrastructure and training is required, as well as a constant supply of non-reusable materials.
4. In poor countries, surgical services are concentrated almost entirely in cities and are largely reserved for those who can afford them. In Haiti, for example, a community-based survey conducted in the 1980s indicated that cesarean-section rates in a large area of southern Haiti were close to 0%; maternal mortality was close to 1400 per 100,000 live births.[25] However, among the wealthy of that same country, cesarean rates do not vary much from those registered in the United States.
5. In addition, the overall burden of the disease associated with surgical care has not yet been adequately defined, and it is likely that the current figures are artificially low.[26,27] While the total volume of real surgical cases can be counted, the unmet surgical need is only beginning to be measured.[28] Thus, global surgical initiatives have met many obstacles caused by the lack of data that reflect the magnitude of the unmet need for surgery.[14,17]

These factors make it necessary to estimate the prevalence and distribution of the burden of surgical disease. With these estimates, interested parties (for example, governments and NGO) would be able to better allocate funding, prioritize resources and provide support. In an effort to assess the number of diseases worldwide, in 1991 the World Bank commissioned a study, the 2nd edition of the Disease Control Priorities Project (DCP, 2006), which estimated that 11% of premature deaths and disabilities could be avoided with the concentration of surgical services in trauma, cancer and congenital deformities.[29] This provided the first clear economic evidence that surgical care could be a cost-effective strategy under certain circumstances compared to other types of care, such as antiretroviral drugs, vaccines and other primary treatments. This economic impact was calculated based on disability-adjusted life years (DALY), which is the sum of years of life lost plus years lost due to disability. The burden of the disease is the difference between real health and the ideal health of a population.[16,29]

Diseases and injuries that are treatable with surgery often occur during the most economically productive years of a person's life. The DALY represents the loss of a healthy life year (death or disability) due to a given condition or injury. Africa has the highest proportion of DALY per 1000 people of any other world region caused by conditions requiring surgery (108,301). Initial estimates indicate that surgery can resolve 7% of the DALY that occur in Africa.[30] However, more data are needed to evaluate the cost-effectiveness of providing surgical services in LMIC, measured in care costs/avoided DALY, to determine the priority of surgical services compared to more traditional global health programs.[31] Some studies reveal that surgical disease is among the 15 leading causes of disability,[32] and conditions requiring surgery represent up to 15% of the total DALY lost worldwide.[16] The DALY calculation "is aimed at achieving a consensual opinion of medical professionals in high- and low-income settings" so that we all speak the same language. Our NGO (*Cirugía Solidaria*) calculates the DALY avoided for each of our surgical activity campaigns.[33–35]

The medical community seems to have finally understood that the surgical management of some common conditions can be a cost-effective intervention. Specialists in public health now admit not only that surgery has a preventive function but also that the surgical treatment provided in low-tech community hospitals is cost-effective.[7,35,36]

Opportunities for Improvement

Several methods have been used to provide surgical treatment in LMIC.

- The traditional model has been to send a trained Western surgeon to a rural inner region of the country, usually a very

remote place with a small, poorly equipped hospital, hoping that the surgeon will make a career of it, as it is often impossible for him or her to be replaced. This model has existed for more than 100 years. Excellent examples would be Dr. Albert Schweitzer and his hospital in Lambaréné (Gabon) and Dr. David Livingstone in central and meridional/southern Africa. This model remains, unfortunately, the prevailing paradigm throughout the developing world.

- Short surgical missions have been an extension of this model and the basis for its continued survival, providing various interim services as a provisional measure or as a recurring but intermittent service. Although this meets the most acute needs, it often does not deliver long-term results, and more often positively impacts the cooperating surgeon far more than the hospital or the local population. These missions ''cannot be a substitute for continuous investment in healthcare, local infrastructure and personnel training, which would allow LMIC to develop their own long-term surgical capabilities''.[37] Although the short-term medical missions to address the medical problems of those living in extreme poverty have often been blamed for their lack of sustainability, this is not the case of what might be called ''vertical focused'' surgical missions concentrating on a single ailment, such as cleft palate, cataracts, hernia or goiter. These humanitarian actions of the surgical teams are praiseworthy; however, there is little information about effectiveness, quality and potential unintended consequences. In 2008, surgeons and anesthesiologists formed the Global Burden of Surgical Disease Working Group to characterize the needs of surgical services and establish standards for care within the international community regarding surgical assistance.[38]
- It is true that these short missions can improve surgical capacity in LMIC, as long as there are surgeons who want to donate their time to those in need and who are able to learn logistics beyond the surgery itself, but the only way to make this sustainable is through the involvement of local health professionals. NGO can offer alternatives in this regard. The WHO Safe Surgery Saves Lives program promotes safe anesthesia and surgical guidelines to reduce complication rates in both developed and middle-income countries.[39]
- More recently, the concept of hospital ''twinning'' has become frequent. A Western university (often a single department) is associated with a similar institution (or department) in an LMIC and develops academic relationships in surgical experience or research.[40,41] Good examples are the Surgery and Global Health Program at the University of California San Francisco[42]; the Department of Global Health and Social Medicine at Harvard University[43]; and Duke Global Surgery, associated with the Duke Global Health Institute[44]; the Institute of Global Health and Infectious Diseases of the University of North Carolina[45] and the Institute of Global Health of the University of Loma Linda, etc.[46] The Spanish Association of Surgeons could also coordinate a hospital twinning project in an LMIC.

Any model of cooperation must necessarily go through evaluation. Evaluation should become the main priority in global healthcare. Currently, it is only an afterthought. A massive expansion of investment in global healthcare during the last decade has not been matched by an equal commitment to evaluate these investments. This imbalance damages the entire global healthcare movement. Without proper supervision and accounting, countries, donors and taxpayers have no idea whether their investments are working or how they are working. *The Lancet* aims to build a global network to support evaluation in order to propose new and better ways of evaluation and research. We should see adequate resources invested in designs that match the programmatic realities in these countries. Research will not only maintain interest in global health: it will improve the quality of decision-making, improve efficiency and develop the capacity to understand why some programs work while others do not. Evaluation matters. Evaluation is science. And the evaluation costs money.[47]

When designing surgical interventions to improve health in the poor populations of developing countries, it would also be convenient for this design to be based on the evidence of previously proven actions. Apart from vaccination, few global health interventions are based on evidence. Global evidence-based healthcare requires the use of evidence from randomized controlled trials and other scientifically valid studies to assess global health interventions and to measure progress in improving global healthcare. Randomized controlled trials of global public health interventions are often group trials, randomized groups or communities. When evidence from randomized trials is not available or difficult to generalize, observational studies provide useful information, although it must be interpreted carefully.[48] When feasible, individual randomization is still the best available method for evaluating an intervention, although observational studies can also be relied upon.

Another fundamental pillar of the solution is training. In recent years, there has been a major change in the practice of volunteer surgery. The traditional paradigm, which consisted of providing services that involved temporary transfers of resources in most missions, has turned and has been complemented, and in many cases has been replaced, by the long-term construction of partnerships aimed at increasing local surgical capabilities. This latter model is seen as a superior approach to dealing with the substantial burden of surgical disease and the labor needs of LMIC.[49] A newer model is the development of surgical training programs in LMIC to train local doctors as surgeons so they can treat their own people in their own country. These people are much more culturally aware, communicate in local dialects, become excellent role models for local youth, and may not suffer the frequent psychological stress that expatriates are likely to experience. An excellent example is the Pan-African Academy of Christian Surgeons, which started training programs in general surgery in Africa in 1996. This academy now consists of 8 five-year programs, which have trained a total of 43 residents in 6 countries, with a final aim to train 100 African surgeons by 2020.[50] Each of these programs is fully certified by the Faculty of Surgery of Eastern, Central and South Africa or the West African College of Surgeons.

To date, the results from the training of surgical residents in LMIC have been very encouraging. Residents who finish are highly skilled in surgical techniques and combine different abilities from Western-trained surgeons. These residents have

extensive experience in general surgery, but also have experience in simple craniotomies, radical prostatectomies, placement of intramedullary rods, cesarean sections and deliveries, etc. They have a somewhat more limited exposure to laparoscopic or minimally invasive techniques and endovascular procedures. However, at the end of their studies, up to 22% of graduates from sub-Saharan medical schools migrate outside the continent, mainly due to financial considerations and the lack of postgraduate training in their countries of origin.[51] It is important to emphasize that the Cuban educational model provides additional components that seem to produce doctors with more capacity to work and stay in difficult places.[52]

In a combined effort to address these challenges, a partnership was created in 2010 between the National University of Rwanda (NUR) and the Center for Global Surgery at McGill University Health Center of Canada (CGS-MUHC). Its purpose is to increase Rwanda's surgical workforce (which in 2010 stood at 12 general surgeons for a population of 11 million) through the establishment of a training program in surgery at the invitation of Rwanda's surgical leaders, which allowed for a targeted intervention based on local needs rather than Western models and expectations. In addition to improving the learning experience of the residents of Rwanda, this program addresses one of the main obstacles to the provision of medical care in LMIC, which is the retention of professionals in their country. The models based on the creation of surgical capabilities are essential to deal with the burden of morbidity derived from injuries and surgical diseases in LMIC. Educational programs aimed at local health professionals in the early stages of their careers are the cornerstone of such success.

This Rwanda-Canada paradigm for surgery education creates future independence for a growing local surgical capacity that could be used in other LMIC. The problem is immense and the challenges are great. To reduce the burden of surgical disease in such settings in the future, programs should be based on paradigms like that described in Rwanda, creating a harmonized system with a global approach using sustainable education programs that encompass multidisciplinary approaches in various specialties, with surgery, anesthesia, obstetrics and nursing at the forefront of such efforts.[53]

Our NGO (*Cirugía Solidaria*), with cooperative activities in surgery in LIC and LMIC countries, has been using a hybrid system that incorporates, in addition to medical assistance, training of local surgeons with procedures and means from Spain. The experience so far is valuable and promising and incorporates new procedures in each campaign.[33–35] Our proposal for surgical cooperation is based precisely on this type of LIC and LMIC. We do not think that LIC should be excluded from surgical care, although primary care should be prioritized. In May 2015, the World Health Assembly unanimously approved resolution 68.15: ''*Strengthening emergency and essential surgical care and anesthesia as a component of universal health coverage*.'' All countries were urged to incorporate surgical care into their healthcare systems as ''a step toward universal health coverage''.[54]

The results of *The Lancet Commission* on worldwide surgery highlight the resulting improvements in the national economies of countries that carried out a modest investment in surgical services.[55]

Presently, our country lacks an adequate and updated record of cooperation in surgery in these LMIC. It would be desirable that the initiatives the Humanitarian Collaboration Group of the Spanish Association of Surgeons are carrying out with FCOMCI (Medical Colleges) and the AECID (Spanish Agency for Cooperation and Development) joined forces in what should be a Spanish agency of surgeons who design and coordinate surgical cooperation activities based on real needs.

Conclusion

The treatment of conditions requiring surgery in LMIC begins to be considered as a fundamental element for the improvement of health of these countries, which have a high rate of DALY. The solutions to improve medical care must come from everyone involved: governments, institutions, universities, local surgeons, NGO, etc. International cooperation in surgery based on the individualized attention of patient series is not enough. It is necessary to overcome the concept based on needs, so that the activities are not merely aimed at covering

Fig. 1 – Clinic in Kafana (Mali).

Fig. 2 – Surgery with local surgeons in Mali.

immediate needs, but are instead aimed at evaluating needs, designing strategies based on those needs, training local staff and involving local resources (Figs. 1 and 2).

Conflict of Interests

The authors have no conflict of interests to declare.

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