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Review

Provision of essential surgery in remote and rural areas of developed as well as low and middle income countries

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ABSTRACT

Background: Surgery is increasingly becoming an integral part of public health and health systems development worldwide. Such surgical care should be provided at the same type and level in both urban and rural settings. However, provision of essential surgery in remote and rural areas of developed as well as low and middle income countries remains totally inadequate and poses great challenges.

Methods: Though not intended to be a systematic review, several aspects of primary health care and its surgical aspects in remote and rural areas were reviewed. Search tools included Medline, PubMed and Scopius. Health concerns such as quality health care and limitations, as well as infrastructures, surgical workforce as well as implications for planning, teaching and training for surgical care in remote areas were searched.

Results: The dire shortage of surgeons and anesthesiologists in most low and middle income countries means task shifting and training of non-physician clinicians (NPCs) is the only option particularly in most developing poor countries.

Conclusion: The best means of bringing surgical care to rural dwellers is yet to be clearly determined. However, modern surgical techniques integrated with the strategy as outlined by the World Health Organization can be brought to rural areas through specially organized camps. Sophisticated surgery can thus be performed in a high-volume and cost-effective manner, even in temporary settings. However, provision of essential surgery to rural and remote areas can only partly be met both in developed and in low and middle income countries and it will take years to solve the problem of unmet surgical needs in these areas.

1. Introduction

Worldwide, rural and remote areas share common issues of dispersed and isolated populations together with communication, transport, and climatic barriers which makes delivery of health care to these areas challenging and poorly accessible.[1–3]

Definitions for the term rural that are seldom in agreement in addition to the fact that rural deprivation is often “hidden” not usually reflected in commonly used indices and measuring tools, constitute major handicaps to analysis of problems of health care delivery to these areas.[2,4] Unfortunately, dichotomous definitions permit classification into only two categories, metro/urban or nonmetro/rural. This cannot describe the metro/nonmetro continuum or the range of variation that exists in nonmetro areas.[4,5]

There are also basic and fundamental differences between developed and developing countries not only between rural areas but between urban areas as well. Rural and remote in developed countries may be, and usually are, far advanced in sophistication than even the capital city of an emerging country.[6–8] ‘Remote’ therefore is not so much a matter of kilometers from a place of care, as one ‘far from the desirable availability of quality of care’.[6,8]

What seems to be a problem of low and middle income countries is in fact a global problem irrespective of economic development which has led in 2006 to the introduction of the Rural International Surgeon section to a renowned surgical journal.[9–13] Contributions coming from different developed and developing countries have questioned the validity of current basic medical training reporting and have reported good results with the use of trivial cheap surgical material instead of advanced expensive technologies.[14–20]

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2. Method and materials

The present review aims at defining the problems of surgical health care delivery to rural areas whether in developed or developing countries. Solutions offered to these problems are also analyzed. Though not intended to be a systematic review, health concerns such as quality health care and limitations, as well as infrastructures, surgical workforce, implications for planning, teaching and training for surgical care in remote and rural areas described in the English medical literature over the last 15 years were searched. Search tools included Medline, PubMed and Scopius. All retrieved abstracts were screened for their relevance then full articles were reviewed. Several papers were found to be mere repetitions of previously published work. Only the original work or the most detailed thereafter has been considered. Due to the nature of the topic, most reviewed papers were either descriptive, expert opinion, or epidemiologic studies. Considering value and strength of presented evidence of such work was irrelevant. WHO published guidelines were considered as reference point.

3. Primary health care (PHC) and surgery

Policies of health services have universally been developed as a 'ne size fits all' approach based on urban models. This approach can be problematic for primary care agencies in rural areas.[21,22]

It is a fact that countries with sound economies tend to have a better health status.[23] However, independently of a given country's economic position, external factors such as political instability or devastating epidemics like HIV/AIDS profoundly influence health outcomes as well.[24] Regardless of this fact, challenges for public health and health care today are particularly acute in rural communities whether in developed or developing countries.

Primary Health Care (PHC) has always been considered a priority in emerging countries not only in remote areas but in urban agglomerations as well. Elective surgery is considered a luxury in these countries.[25] Deaths due to surgically treatable diseases may not be as important as the great killers (malaria, pneumonia, diarrhea, and malnutrition in children and HIV/AIDS in adults),[26] however, surgical treatment of common surgical conditions (traumatic injuries and obstetrical complications) is increasingly emerging as an integral part of public health and health systems development worldwide.[26–30,32–34]

Though surgery might have been thought to lie outside the scope of public health, as estimated in 1990, 10% of all deaths and almost 20% of deaths in young adults are still likely to be due to an untreated surgical condition.[26,30] Without surgical and obstetrical services, up to 10% of the population will die from injury and 5% of pregnancies will result in maternal death.[26,31,32]

A serious concern regarding health care is that much less is known about health care needs and provision in rural and remote areas than about urban areas.[2] There is also scant literature concerning the epidemiology, natural history, and cost-effective treatment of surgical conditions in the emerging countries context as well as research evaluating the delivery of surgical services.[27] Regardless of this fact, and despite numerous limitations, the demand for surgery in rural areas worldwide should not be and is not different from the surgery carried out in large cities.[35] Providing the same type and level of surgical care in both urban and rural settings, however, poses great challenges even in the most advanced and affluent societies.[36]

The questions most insistently asked nowadays are: what "space" will health treatment have, and what should we understand by "care" or "assistance", in a future scenario characterized by a renewed dimension of the concept of health worldwide?[37]

4. Health concerns in remote and rural areas

Most rural communities in both developed and low and middle income countries have restricted access to health care services and are too small and remote to sustain specialist services for obvious reasons.[38] Serious concerns that the situation is but deteriorating in that regard are sadly real.[1–3,39–44]

Unfortunately, easily treatable but potentially fatal surgical conditions are common among poor rural dwellers.[39] Their health problems and surgical pathology may even be more serious by the time they are diagnosed.[29,39] Patients might not be able to get to a hospital quickly in an emergency and certainly, the enormous cost of emergency care is likely to deter the poor from accessing life-saving surgery. Rural patients also might not want to travel long distances to get routine checkups and screenings in centralized services of higher quality of care.[2,6,40,45–47] Many rural dwellers dislike visiting urban hospitals due to poverty, ignorance, fear, distance or unpleasant city experience.[39] They may even avoid visiting rural hospitals when available.[48]

5. Health care infrastructure and surgical workforce in remote and rural areas

Rural hospitals and health departments and networks are vital components of the rural communities they serve.[49] Functioning hospital surgical services, however, in many remote rural areas, particularly in developing countries, simply do not exist or cannot be reached and qualified surgeons may not be even available at all.[27,47,50–56] Sadly enough, distribution of surgical facilities within countries might not be optimal as well.[6,54,57] In most developing countries, existing surgical infrastructure and expertise are concentrated in urban centres and are grossly insufficient or inadequate.[39]

Historically, rural health care delivery in developed countries has focused on medically qualified general practitioners, family physicians, or nurses providing primary care services. In fact, most medical services, including common surgical emergencies, complex birthing, anaesthetic and simple surgical procedures, can be provided by these specially trained rural health practitioners reducing the need for rural people to travel to major centres.[1,26,38,42,43,58]

In low and middle income countries, however, there is a universal shortage of even general practitioners and family physicians willing to practice in remote and rural areas. There is hence no choice but to give paramedics the responsibilities of surgery which is proposed as an economic and realistic alternative. Most surgical cases (i.e., abscesses, tropical pyomyositis, incomplete abortion and postpartum hemorrhage, strangulated hernias, obstructed labor) can be managed by unqualified personnel if properly selected and trained on the job.[26] Intermediate operations may be performed by middle-level health workers using local, regional, light general anaesthesia or combinations thereof, without the help of an anaesthetist. A large volume of surgery can be performed using simple equipment which needs little maintenance and low running costs with low mortality and morbidity.[1,36,59–65]

Retaining rural health practitioners in location is universally another major and critical problem.[23,27,34,66] Strategies such as increased support for flexible continuing medical education and professional development to promote retention of trained personnel in rural areas are desperately needed.[38] In developing countries, barriers are also needed to prevent the early loss of graduates from medical and nursing schools through immigration.[67]

6. Quality of health care in remote and rural areas and limitations

Although there is little agreement on just what aspects of care should be measured to indicate its quality, there is a general assumption, without much evidence, that the quality of care in rural hospitals is lower than that provided in larger urban hospitals.[58] However, views may differ greatly. Health professionals tend to focus on technical aspects of care, while patients and their families are more concerned with access, interpersonal communication, convenience and cost.[42,58]

Irrespectively, consideration of the quality of procedural rural medical care should include the needs and expectations of those living and working in a smaller, more familiar environment.[58] Anyway, it seems that despite problems associated with rural surgical practice and lack of essential facilities, a commendable measure of success can be achieved.[64]

Despite all the difficulties and the numerous limitations in workforce, infrastructure, equipment, and resources, many rural communities value highly their local rural hospital, and advocate the maintenance of hospital services close to home. Rural hospitals are a real treasure to be valued, nurtured, understood, and embraced.[42,49,66] Under circumstances of adequate staffing and support, the rural hospital may be also an ideal learning site for medical student, interns, residents and generalists.[27,41] Unfortunately, the choice of having surgery performed by surgeons in well equipped facilities, though unaffordable by the low economies of developing countries, is still likely to represent a formidable barrier to implementing surgical systems in rural areas of most countries.[26]

7. Implications for planning, teaching and training for surgical care in remote areas

Undoubtedly there is a critical shortage of surgically trained personnel in rural and remote areas in both developed and developing countries.[28] Training rural general practitioners to acquire basic surgical skills requires adapting existing medical education programs. Training of paramedical personnel, however, assumes the availability of skilled surgeons willing to actively and didactically teach none medical students to perform surgery under supervision. It requires also adequately equipped facilities, and some expensive technology in referral centres.[26] Unfortunately, training in many emerging countries cannot be properly performed in referral hospitals, as these facilities are scarce, understaffed, and have poorly maintained equipment with scarcity of drugs and supplies. Moreover, local surgeons are often too few and too busy to be interested in teaching.[26]

Capacity building through training on the job nevertheless is a relevant way to improve the capacity of health care systems. It would be much more efficient that trainees are taught how to use their own equipment in their own facility, under their own conditions, and with their own familiar team on hand. Training must concentrate on the surgical treatment of the most prevalent conditions in the specific environment. Local training can be supplemented later with internships in hospitals.[26] Despite the fact that there are enormous individual differences in the learning process of surgical skills, many local persons, even if not educated, can be progressively trained how to perform a caesarean section and how to operate a strangulated hernia. Necessary expertise can be achieved through 2–3 years of training.[26]

Training paramedics in surgery and employing them as surgeons has been so far implemented to a limited extent in few developing countries.[26] Three African countries (Mozambique, Tanzania and Malawi) have started an ambitious program of two or three years of special surgical training to assistant medical officers (AMOs) that are health personnel without the medical degree.[28] The AMOs perform most of the clinical health care outside of cities and a significant fraction of the surgical services even within the cities.[23,28,60–63] Mozambique has moved a step farther by training medical assistants to substitute for surgeons, with good results.[23,60]

Unfortunately in most developed countries, current hospital-based medical education and training programs are not adequately preparing junior doctors for rural and remote practice.[68] Introduction of obligatory vocational training for all medical graduates with senior level rotations in endoscopic, gynecologic, obstetric, and orthopedic surgery and mentorship with rural surgeons would be optimal. With this type of training general surgeons in the true sense of the word may be formed[34,36,64,68–72] (Table 1). Initiatives at the undergraduate level, including increasing rural exposure and integration of rural context into training, need to be further developed at the early postgraduate level. This will further the effort to prepare junior doctors for rural practice and minimise some of the barriers currently experienced.[68]

To contain costs and ensure high quality, current health service management policy, however, appears to support the rationalisation and centralisation of service delivery in larger mainly urban centres.[34] It is a fact that vertical programs do not encourage the development of efficient health care systems. A more comprehensive view of health may provide primary facilities, a more inclusive all-disease approach and global responsibilities.[26,32] The progressive and necessary disappearance of the boundaries between the various medical/surgical specializations aimed at making treatment less fragmented[37] may be the proper future path.

8. Safety, appropriateness and effectiveness of surgical task shifting to non-physician clinicians

There is resistance to delegating surgical procedures to lower cadres and it may be difficult to be comfortable with a paramedical performing surgery no matter how well trained he may be. Shifting clinical responsibilities from higher to lower cadres raises ethical concerns about lowering standards of care. Surgery is as much an exercise in clinical judgment as in practical manual dexterity. Such complex skills and knowledge cannot be adequately transferred in a shortened training course.[26,71] It is also a known fact that surgical practice attempted by partly trained doctors beyond their competence may have disastrous consequences. Nevertheless, it is obvious that a distinction must be made between surgery essential "to save life and limb" and operations that can cause unacceptable morbidity in unskilled hands.[26]

The WHO's Clinical Procedures Unit has established a list of surgical tasks that can be safely and effectively performed at the district hospital level. This work needs to be expanded to define

Table 1
District surgical practitioners should be able to manage most obstetric, orthopedic, trauma and abdominal emergencies, including the following.

Caesarian section
Laparotomy
Amputation
Surgical treatment of acute infection
Resuscitation
Head, chest and abdominal trauma
Hernia repair
Acute closed and open fractures
Management of wounds and burns

WHO E-learning tool kit: Integrated management on emergency essential surgical care.

Table 2
integrated strategy to maximize the effectiveness of district hospitals.

Personnel with appropriate education and training
Practical continuing education programs in clinical management to maintain the quality of care
Appropriate physical facilities
Equipment and instruments to meet the needs of district surgical services
A reliable system for the supply of drugs and medication, surgical materials and other consumables
A quality assurance system

WHO E-learning tool kit: Integrated management on emergency essential surgical care.

a framework for task shifting that would outline which procedures can be safely performed by different health cadres. Evaluations of task shifting in surgery have concluded that non-physician clinicians (NPCs) are safe and effective. However, other studies in developing countries have reported surgical mortality rates as high as 5%–10%. Defining the limits of task shifting is essential to ensure quality of care. This requires innovative testing of new approaches together with rigorous evaluation to build the evidence base for policy. To ensure adequate quality and encourage recognition of responsibilities, the provision of training, supervision, monitoring, and evaluation are all critical.[71]

9. Conclusion

Isolated dispersed populations in rural areas and large distances separating them from available health care facilities are facts not likely to be changed soon and seem to be insurmountable obstacles. Moreover, the common perception that surgical care is merely a luxury in poor countries must be reconsidered and its essential role in global public health must be acknowledged.[72] Traditional models of care, largely focused on doctor-led delivery, will no longer be viable particularly in developing countries. Redesign of services will therefore be required, with redefining of roles and responsibilities.[1]

The best means of bringing surgical care to rural dwellers, however, is yet to be clearly determined.[39] Surely, simple surgical services can be offered to rural populations and basic surgery is feasible, highly cost-effective, and safe.[26] Integrated strategy as outlined by the World Health Organization to maximize the effectiveness of district hospitals to decrease death and disability from trauma and pregnancy-related complications is summarized in Table 2.

Ultimately, in a setting where there is a disadvantaged population with inadequate access to medical care, specialist outreach from a regional centre can provide an alternative more equitable means of service delivery than rural hospital-based services alone.[73] Modern surgical techniques can be brought to rural areas through specially organized camps. Sophisticated surgery can thus be performed in a high-volume and cost-effective manner, even in temporary settings.[32,72,74,75] In New Zealand, a highly sophisticated mobile theatre, the “surgery bus”, has been providing opportunity for day surgery in rural areas. This model, however, raises some concerns about intra-operative as well as post-operative safety[70] and certainly is not applicable in low and middle income countries.

The dire shortage of surgeons and anesthesiologists in most rural areas makes task shifting an acceptable alternative. Training of NPCs is the only option in low and middle income countries. If Western and primarily urban model of care were to be replicated, then only a fraction of the millions of people in need of treatment in low and middle income countries would benefit, while most of the rest would die. Task shifting in surgery should be seen primarily as a way to increase access to care which is definitely better than no care at all. While medical ethics underline the necessity to provide the best standard of care to patients, public health ethics require health professionals to also consider how to help patients who cannot access care being mindful not just of the fortunate few who get to see a surgeon, but of the invisible majority who never will.[71]

Certainly developing countries will not be able to achieve this goal without assistance.[26] Efforts should focus on training, supervision, and recognition for these de facto surgeons and anesthesiologists. With task shifting, however, only part of the needs can be met and it will take years to solve the problem of unmet surgical needs.[26,71,72]

Shortening surgical training and task shifting programs are not substitutes for provision of adequate and safe surgical care by well trained surgeons in well equipped facilities. They are only intended to produce more hands for basic and life-threatening surgical services until such a time when all the development indices have spread to engulf the rural population whether in developed or low and middle income countries.[76] However, resistance from senior academic clinicians must yet to be overcome.[77]

Certainly there are basic and fundamental differences not only between rural areas in developed and developing countries but also between urban areas as well. Despite the fact that more resources and general practitioners are available in developed countries, it remains that basic surgical care in rural areas of both developed and low and middle income countries is deficient, though to some variable degrees. The immediate most reasonable and practical solution for both is task shifting to the most educated and trained personnel at hand whether a physician general practitioner or an NPC.

Giving lower cadres more responsibilities is, however, unlikely to be sustainable unless adequate legal protection, recognition, licensing, registration and remuneration are provided. In Mozambique, this training is recognized by the government and NPCs are treated by doctors as colleagues. Malawi, Zambia, and Tanzania also have well established cadres of surgical NPCs that are recognized formally and supported by the Ministries of Health.[71] Career structure and job clarity, competency-based training, support and assistance by trained professional surgeons, monitoring and evaluation, performance rewards and career progression, supportive managerial arrangements, adequate equipment and supplies and quality assurance for safety are all required as well for the success of surgical task shifting in rural areas worldwide.

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Conflict of interest

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