Surgical need & capacity in low and middle income countries
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Citation for published version (APA):
Groen, R. S. (2013). Surgical need & capacity in low and middle income countries

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INTRODUCTION
Introduction

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Lifesaving surgical care was calculated surgical care can, or is, provided on a continuous basis [2,3]. The consequences of this serious lack in access to another vital role in secondary prevention of diseases through establishment of screening programs, including dressing changes has not only proven to be effective but significantly reduced costs as well [16]. In the case of following Farmer's pronouncement in 2008, many refer to surgery as the 'neglected stepchild of global health', prevention of testicular cancer in cases of ectopic testis, prevention of intestinal strangulation of an inguinal hernia repair, mosquito mesh has been proven to be a safe alternative for the expensive commercial meshes grafting, has resulted in cost-reduction in South-Africa [15], while open burn management instead of daily dressing changes has been now shown to be highly cost-effective in most situations through innovation and ingenuity of the doctors, including surgeons, are seeking new means of cost saving for the care they provide, besides maintaining adequacy to surgical deliveries is of primary importance to achieve the MDG4 on child health and MDG5 on maternal mortality.

The failure to even mention the need for surgical care to achieve the MDG goals rates, there is also a known growing need for cancer care, including breast and cervical cancer [7]. However, as mentioned in the prologue of this thesis, surgical care is conceived by various national and international investment [11]. Although there is a high initial investment for surgical capacity, surgically treatable conditions have been now shown to be highly cost-effective in most situations through innovation and ingenuity of the doctors, including surgeons, are seeking new means of cost saving for the care they provide, besides maintaining adequacy to surgical deliveries is of primary importance to achieve the MDG4 on child health and MDG5 on maternal mortality.

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INTRODUCTION

Universal access to surgical care in low and middle income countries (LMICs) is inadequate and far behind that in well developed countries. An estimated 2 billion people worldwide live practically without any access to surgical care [1]. Even in areas where some surgical facilities are present it is highly debatable that safe and adequate surgical care can, or is, provided on a continuous basis [2,3]. The consequences of this serious lack in access to surgical care for the inhabitants of LMICs is evidenced by the overwhelming statistic of 342,900 maternal deaths per year and a death rate from accidents of 5 million per year [4-6]. There is little doubt that many of these deaths could have been averted by timely surgical care. In addition to these impressive data on avoidable death rates, there is also a known growing need for cancer care, including breast and cervical cancer [7]. However, upgrading surgical care has not been part of the discussion on non-communicable diseases held by the United Nations (UN) [8,9], has only been marginally discussed in relation to maternal mortality[10], and has hardly been mentioned in relation to the rising incidence of trauma and injuries [4-6].

As mentioned in the prologue of this thesis, surgical care is conceived by various national and international agencies as an expensive investment [11]. Contrary to popular belief, recent efforts have shown that surgical care is quite competitive in terms of cost and benefit for the community. Lifesaving surgical care was calculated in an Indian district hospital to be only 10.9$ per Disability Averted Life Year (DALY) [12]. This was compared to a cost in their district of 95 per DALY for vitamin A distribution, 30$ for breastfeeding promotion and 35$ for ORS in case of diarrhea treatment. Similar calculations were repeated in Sierra Leone in a hospital run by a Non-Governmental Organization (NGO), giving 32.78$ per DALY for surgical care while in a Cambodian trauma hospital 77.45$ per DALY for surgical care [13-14]. This indicates that cost-effectiveness studies need to be placed in the context of the facility and local economy.

Doctors, including surgeons, are seeking new means of cost saving for the care they provide, besides maintaining the DALY calculations. Active management for patients with burns, using early debridement and if needed skin-grafting, has resulted in cost-reduction in South-Africa [15], while open burn management instead of daily dressing changes has not only proven to be effective but significantly reduced costs as well [16]. In the case of hernia repairs mosquito mesh has been proven to be a safe alternative for the expensive commercial meshes [17-18]. Thus, not only has provision of appropriate surgical care in these underserved areas been effective, but has been now shown to be highly cost effective in most situations through innovation and ingenuity of the practitioners in place.

Whether surgical care is cost effective or not, surgical care plays a critical role in curative interventional medicine for many wounds, burns, bone fractures, acquired or congenital deformities, masses, swellings and especially, intra-abdominal pathologies. In addition, surgical care plays an important role in preventive care, such as primary prevention of testicular cancer in cases of ectopic testis, prevention of intestinal strangulation of an inguinal hernia as well as prevention of deformities and disabilities by providing adequate trauma care. Lastly, surgery has another vital role in secondary prevention of diseases through establishment of screening programs, including e.g. biopsies for breast masses, as well as prevention of progression of disease (tertiary prevention), as needs to be done for cancerous lesions whose timely excision prevents subsequent metastases and eventual fatalities. In the cases of placenta previa, fetal asphyxia and cephalopelvic disproportion (CPD), surgery in the form of a cesarean section is the only safe means of preventing permanent multiple disabilities and/or death in the newborn. Although there is not a single Millennium Developmental Goal (MDG) on access to surgical care, adequate access to surgical deliveries is of primary importance to achieve the MDG4 on child health and MDG5 on maternal mortality. The failure to even mention the need for surgical care to achieve the MDG goals illustrates the lack of focus of these important undertakings which needs to be corrected.

Following Farmer’s pronouncement in 2008, many refer to surgery as the ‘neglected stepchild of global health’, on the basis of three main reasons that were identified: (1) that the global health agenda was dominated by communicable diseases, (2) that surgeons have only recently become involved in raising awareness of the importance of surgical care from a public health perspective and (3) that surgery involves an expensive initial investment [11]. Although there is a high initial investment for surgical capacity, surgically treatable conditions
appear to be a high burden for the populations in LMICs. Estimation of the surgical burden of disease in LMIC’s was attempted by Debas in Chapter 65 of the 2nd edition of the Disease Control priorities in Developing countries. Results of a survey, in which physicians from all over the world were asked to estimate their daily case load related to surgical care, provided estimates of surgically treatable conditions within the health care seeking population [19]. The resultant figure of 11%, is now widely quoted as the ‘burden of surgical disease’ which is inaccurate since this only tells us what a physician “thinks” constitutes that part of the total burden of disease that could be surgically treated.

There is a major gap in understanding the burden of surgical disease which is partly related to the broad spectrum of diseases which can be treated surgically. The Global Burden of Surgical Disease Working Group defines surgery as ‘... suturing, incision, excision, or manipulation of tissue; or other invasive procedure that usually, but not always, requires local, regional, or general anesthesia.’ [20] The available measurements of the global burden of surgical disease is usually reported as disease specific or originates from frequently inaccurate and sometimes fragmentary individual hospital data or from Ministry of Health Annual Reports. In 2000 a population based survey in Kenya revealed an incidence of injuries of 15,000/100,000 people per year, only counting those who attended successively a clinic or hospital [21]. A small household survey (162 households) on burns in Ethiopia, estimated a cumulative lifetime incidence of 5-11% [22]; hospital data from Eastern Africa combined with the population size resulted in a report of an estimated need for hernia repair of 175/100,000 and an incidence of strangulated hernias of 30/100,000 yearly [23]. Mock et al. have investigated road traffic injury related health problems with a population based survey in Ghana, and others have followed with the same survey for subgroups of the population or in other LMIC’s [24-26]. Based on these disease specific examples, we hypothesized that there is a major incidence of presently unrecognized and non-recorded illnesses which can be surgically treated, and that these conditions (including burns, hernias, deformities) are quite common among the general public of Sierra Leone, as well as in other low income countries.

The aims of this thesis are twofold. The first aim is to document the need for surgical care in Sierra Leone and the second aim is to determine the surgical capacity, including safety measures for health care personnel. Sierra Leone is used as an initial case study because of its long standing collaboration with Surgeons OverSeas (SOS) [27,28] and willingness on the side of individuals and the Ministry of Health and Sanitation as well as the National Statistics bureau (Statistics Sierra Leone (SSL). Sierra Leone is a small west-African country (population 6 million; area 72,000 km²) and ranks 180 of the 187 nations on the UN Development Index, with a Gross National Income (GNI) of 340 US$ per person per year and a poverty ratio of over 70% [29]. The major health indicators for Sierra Leone reveal that life expectancy at birth is 48 years, an estimated 174 per 1,000 children die before their fifth birthday, and maternal mortality rates are among the highest in the world [30].

Surgical need
In order to investigate the epidemiology of surgical needs, I developed a surgical survey tool for SOS as their Surgical Research fellow. The draft survey questionnaire was based on the following documents: 1) World Health Organization (WHO) Guidelines [31], 2) a Demographic Health Survey (DHS) [32] and 3) the survey on road traffic incidents used by Mock et al. [33]. Figure 1 illustrates the experimental design process.

The surgical conditions included in the survey were selected in order to be recognizable by lay-persons and which are in need for the greatest attention, because of their frequency and potential for treatment with available resources, and which fit best in the broader categories such as: a variety of wounds, masses, burns and congenital and acquired deformities, as well as a group of symptoms like recurrent discharge for osteomyelitis, and incontinence from urinary fistulas. A SOS Research Group was formed following the creation of an investigative tool to provide comments and suggestions for improvement of the questionnaire through e-mail correspondence. This group ultimately consisted of 46 surgeons, health experts, nurses, medical students and residents from academic and rural medical centers in 23 countries. An additional outcome of the discussions was the decision to use iPads (Apple, California) in the data collecting process. The arguments against computer assisted data entry included initial investment, need for the programming, possible breakage or theft, and the need for training; the arguments for this investment were overwhelming and included better standardization of the methodology, facilitating the collection of the data and their recording, as well as their eventual statistical
Surgical capacity of Sierra Leone is extremely limited; one source reveals 10 local practicing surgeons and 4 fulltime medical officers who provide surgical care at government hospitals [37] while another reference describes only five registered surgeons [47] in the country; there are only 5 gynecologists serving in the governmental health care system [45]. The peri-operative specialized nursing care is also limited. Surgical relief

Figure 1: SOSAS (Surgeons OverSeas Assessment of Surgical Need) survey tool development and timeline.

Collaboration with the University of Virginia Center for Survey Research led to the establishment of a proper survey methodology. The survey underwent initial trials of cognitive interviewing and pre-testing prior to its use in pilot studies and its subsequent implementation. The Royal Tropical Institute in Amsterdam further sharpened the research project with comments from their ethical board and by the critical review by Statistics Sierra Leone (SSL) as well as the College Of Medicine and Allied Health Sciences (COMAHS) of Freetown Sierra Leone.

More detailed information about SOSAS and the execution as well as results of this study can be found in chapters 1 through 6. Chapter 1 discusses the pilot testing of SOSAS in Sierra Leone. The overall results can be found in Chapter 2; Chapters 3 through 5 present and discuss the results of the study in detail, with special attention focused in each on trauma (Chapter 3), specific pediatric needs (Chapter 4), and specific needs for women (Chapter 5) respectively. Chapter 6 discusses the execution and results of SOSAS conducted in Rwanda which explores the needs in Rwanda as well as confirms the reproducibility of SOSAS in another site (country) by another principle investigator and different local personnel.

Surgical Capacity
The logical sequence of investigations in regard to a national surgical care delivery system, we feel, should first address the surgical needs of the population for which we designed the SOSAS tool and applied it in 2 countries so far. Once surgical need is determined, surgical capacity can be addressed in a purposeful manner. Currently there are more published manuscripts [3, 34- 46] about the scarce surgical capacity than about surgical epidemiology. Such initial assessment of the current capacity in an area or a country may be misleading as the first step in addressing capacity building unless the need for the services in the area is first known. This approach is most likely a direct result of the more readily available tools to estimate the surgical capacity (eg. number of operating rooms, surgeons, anesthesiologists, equipment etc.) and therefore dictated by relative ease of evaluation and calculation. This may not, however, provide the needed information for what capacity is required in relation to the need for surgical services in the community or in the country.

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efforts from Non-Governmental Organizations (NGOs) that worked in Sierra Leone during or shortly after the ten year civil war (till 2002) have mostly left the country, resulting in a greater scarcity of surgical care than existed during the conflict [48-52].

In 2008 an assessment of surgical capacity of Sierra Leone was done in the 10 governmental hospitals which were designated as providers of surgical care. The initial assessment used the ‘Tool for Situational Analysis to Assess Emergency and Essential Surgical Care’ constructed by WHO Global Initiative of Emergency and Essential Surgical Care (GIEESC) [37]. This assessment showed a major lack of infrastructure, anesthesia materials (such as respirators and oxygen supply tanks), basic surgical equipment and lack of surgeons or surgically skilled personnel. When comparing the assessment in Sierra Leone of 2008 with hospitals in the USA during the Civil War (1861-1865), Kushner et al showed that the hospitals in USA in the mid-19th century had better supplies and equipment than are available in the hospitals in Sierra Leone in 2008 [53].

A re-assessment of the surgical capacity of the hospitals in Sierra Leone was done in 2011 with an improved survey tool using a comparison index. Chapter 7 presents the comparison between hospitals in Sierra Leone as well trends over time in surgical capacity. Chapter 8 and 9 emphasize the current surgical capacity for the pediatric population in the light of Millennium Development Goal number 4 (MDG 4) which seeks reduction of the child mortality. Chapter 8 uses the surgical capacity survey tool and Chapter 9 analyzes this in greater detail by reviewing the surgical log books for pediatric cases in Connaught Hospital, the only tertiary hospital in Sierra Leone, where most of the pediatric surgical cases are referred. Surgical capacity includes safety of the procedures for patient and health care providers. The exposure to blood borne diseases by the scarce surgical health care workers is therefore addressed in Chapter 10, which addresses the availability in the operating rooms of protective measures like eye protection, aprons, sterile gloves, sterilizers and suction pumps. This thesis concludes with an overall discussion of our findings on key topics and their significance and suggests directions for further research.
Introduction

References


