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Editorial

A Crucial Role for Surgery in Reaching the UN Millennium Development Goals

The *PLoS Medicine* Editors

In the June 2008 issue of *PLoS Medicine*, Doruk Ozgediz and Robert Riviello made a convincing case that surgical conditions should be considered as "neglected diseases" disproportionately affecting the world's poorest people [1]. "Patients with untreated surgical conditions," they wrote, "as well as the local clinicians struggling to care for them, must gain greater recognition by the global public health community." We welcome their call to bring surgery into the global health conversation.

There are at least five important reasons why providing surgery should be considered a global public health priority. The first is that surgical conditions—defined by Haile Debas and colleagues as conditions that require suture, incision, excision, manipulation, or other invasive procedures that usually, but not always, require local, regional, or general anesthesia [2]—constitute a substantial global burden of disease. In an innovative attempt to measure the burden of surgical conditions, Debas and colleagues estimated that these comprise 11% of the world's disability-adjusted life years (DALYs; one DALY represents the loss of one year of equivalent full health) [2]. Africa faces the world's highest regional rate of surgical DALYs (38 per 1,000 people) [2]. The surgical burden of disease is led by injuries, followed by malignancies, congenital anomalies, pregnancy complications, cataracts, and perinatal conditions.

Debas and colleagues state that when they searched the medical literature they found "no data of value except maybe for cataracts" to inform their estimates [2]. They therefore used an international survey of 32 surgeons, 18 of whom returned completed questionnaires, a methodology that leaves substantial uncertainty around the authors' 11% estimate. Such uncertainty calls for a concerted, coordinated effort to conduct a more formal evaluation of global surgical DALYs.

The second reason to consider surgery as a global public health issue is the emerging evidence of global disparities in surgical care. While the poor world has a greater burden of surgical disease, it receives less surgical services. In a recent modeling study, Thomas Weiser and colleagues estimated that there are 234.2 million major surgical procedures worldwide each year, with 30% of the world's population receiving 73.6% of these procedures and the poorest third receiving only 3.5% [3]. Such data suggest an "enormous unmet need for surgical care in poor countries" [4].

The third reason is that surgery can be remarkably cost-effective when compared with interventions that are considered the building blocks of global public health, such as childhood vaccination. The common perception that surgical care is too expensive and is merely "a luxury in poor countries" has persisted for too long [5]. The cost per surgical DALY averted by providing surgical care at a district hospital in Africa is estimated to be only US$33 (range US$19–US$102) [2]. This figure compares favorably with, for example, the traditional expanded program on immunization (US$7 per DALY averted) or integrated management of childhood illness (US$39 per DALY averted) [6].

A fourth reason is the possibility that building surgical services, which requires infrastructure, supplies, and human resources, may in turn help to build health systems and to strengthen primary care. Surgery can itself, of course, be a form of primary health care, as in managing traumatic joint dislocations, treating open fractures to prevent osteomyelitis, and draining abscesses [7]. Surgeons working in Africa tell us that when they provide surgery at the district level it can act as "an enabler," raising the overall quality of health care and encouraging patients to seek medical attention for other nonsurgical conditions. We acknowledge that these are anecdotal experiences and that it would be valuable to formally evaluate the role of surgical services in health systems strengthening.

A final reason is that—despite considerable hurdles, particularly the human resources crisis in sub-Saharan Africa [8]—it is feasible to deliver surgical services even in the most resource-constrained settings. Louise Ivers and colleagues, for example, have described how they scaled up surgical services over a 20-year period in a rural, isolated, and resource-poor setting in Haiti [9]. The program was provided through the public sector by the nonprofit organization Partners in Health (http://www.pih.org/), integrated with primary health services, and offered free of charge to patients unable to pay. While it is obviously more complicated to provide surgical services than many other public health interventions, such as bed-nets, nevertheless surgery is *not* just the preserve of high-tech tertiary referral hospitals. Many surgical interventions can be provided at the district level and some life-saving operations, such as caesarean section, can be performed by trained non-physicians [10]. Mozambique, for example, began training non-physician surgeons (*técnicos de cirurgia*) in 1984, a program involving a three-year degree followed by two years of supervised work in a teaching institution [10,11]. A 1996

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Abbreviations: DALY, disability-adjusted life year

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review of 2,071 caesarean sections performed by *técnicos de cirurgia* and obstetricians showed that *técnicos*' decision making and quality of care, as gauged by indications for surgery, postoperative deaths, and major complications, were comparable to those of obstetricians [12]. *Técnicos de cirurgia* now perform most major obstetric operations in Mozambique [13].

Paul Farmer and Jim Kim of Partners in Health have argued that global health need not be a competitive race for scarce resources [14]. "If we join forces with international health experts," they say, "with activists, and with those setting health policies, we can build a coherent movement that comes to include surgery." The good news is that we are seeing such a global movement take root.

In 2005, the World Health Organization established the Global Initiative for Emergency and Essential Surgical Care (http://www.who.int/surgery/en/). In June 2007, a meeting hosted by the Rockefeller Foundation Bellagio Center brought together experts not just from surgery and anesthesia, but also from health policy, epidemiology, and health economics to explore how best to increase access to surgical services in resource-constrained African countries. These experts formed the Bellagio Essential Surgery Group and reconvened last month in Kampala, Uganda to review progress [15]. Sam Luboga, the surgeon hosting the Kampala meeting, called on surgeons "to recast their roles" to take more responsibility for education, leadership, supervision, evidence gathering, and advocacy alongside their clinical duties. It is encouraging to see public health professionals and surgeons coming together. The School of Public Health at Harvard, for example, has teamed up with Brigham and Women's Hospital Center for Surgery to create the Center for Surgery and Public Health, which will be hosting a symposium later this year on global disparities in surgical care [16]. And in April 2008, the Burden of Surgical Disease and Access Working Group met for the first time (http://www.gsd2008.org/); one of its goals is to advocate for sustainable funding for global surgical programs.

How can this movement now bring donors on board, given that they have so far shown little willingness to fund programs outside the traditional purview of public health? One strategy that may help is to argue that surgery could play an essential role in meeting many of the 2015 United Nations Millennium Development Goals (http://www.un.org/millenniumgoals/).

For example, trauma care, obstetric surgery, and general surgical services are essential components in reaching goal 4 (reducing child mortality) and goal 5 (improving maternal health). Obstructed labor accounts for 8% of maternal deaths globally, while those women who survive may face a life of disability from obstetric fistulae [17]. Surgery can play a role in tackling infectious diseases (goal 6): male circumcision may reduce the risk of men acquiring HIV through heterosexual sex by 60% [18–20]. With foresight and planning, the impending scale-up of male circumcision services in Africa could help to provide the infrastructure to build surgical services more generally.

There is even a link between surgery and goal 1, the goal of halving the number of people living in poverty. In the developing world, surgical conditions are a major contributor to poverty, and their treatment can yield economic benefits to patients and their families. A national survey in Pakistan, for example, found that blindness, most commonly due to cataract, was associated with poverty; the association was strongest in places with least access to eye services, including cataract surgery [21]. A survey of patients at the Aravind Eye Hospital in Madurai, India found that 85% of men and 58% of women who had lost their jobs as a result of blindness from cataract regained those jobs after surgery [22]. Regained functional vision through surgery generated on average 1,500% of the cost of surgery in increased economic productivity during the first postoperative year. Acute surgical conditions can incur major health expenditure that can leave households mired in poverty. A study in Benin and Ghana found that if a woman develops severe obstetric complications during labor, such as dystocia or hemorrhage, the costs of hospital management escalate rapidly with a potentially catastrophic impact on household budgets [23]. A national survey of the economic effects of injury in Ghana found that injury was very often associated with loss of income for the patient and relatives and with the use of loans and the sale of assets [24].

At this year's Copenhagen Consensus meeting, which brings economists together to find solutions to the world's biggest challenges (http://www.copenhagenconsensus.com/), eight distinguished economists, including five Nobel laureates, were asked a simple question. What would be the best ways of advancing global welfare, especially the welfare of the developing world, if an additional US$75 billion of resources were at their disposal over a four-year period? Their list of 30 solutions includes "improving surgical capacity at district hospital level." The Millennium Villages Project, one of the world's highest profile global health initiatives, is now incorporating essential surgical services into its package of interventions (S. Sachs, personal communication). We are encouraged by these promising signs that surgery is beginning to outgrow its status as the "neglected stepchild of global public health" [14]. ■

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References

1. Ozgediz D, Riviello R (2008) The "other" neglected diseases in global public health: Surgical conditions in sub-Saharan Africa. PLoS Med 5: e121. doi:10.1371/journal.pmed.0050121
2. Debas H, Gosselin R, McCord C, Thind A (2006) Surgery. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, et al., editors. Disease control priorities in developing countries. 2nd edition. Available: http://www.dcp2.org/pubs/DCP/67/FullText. Accessed 23 July 2008.
3. Weiser TG, Regenbogen SE, Thompson KD, Haynes AB, Lipsitz SR, et al. (2008) An estimation of the global volume of surgery: A modeling strategy based on available data. Lancet 372: 139-144.
4. Bickler SW, Speigel DA (2008) Global surgery—Defining a research agenda. Lancet 372: 90-92.
5. Ozgediz D, Jamison D, Cherian M, McQueen K (2008) The burden of surgical conditions and access to surgical care in low- and middle-income countries. Bull World Health Organ. E-pub 6 June 2008. Available: http://www.who.int/bulletin/publish_ahead_of_print/en/index.html. Accessed 23 July 2008.
6. Laxminarayan R, Chow J, Shahid-Salles SA (2006) Intervention cost–effectiveness: Overview of main messages. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, et al., editors. Disease control priorities in developing countries. 2nd edition. Available: http://www.dcp2.org/pubs/DCP/67/FullText. Accessed 23 July 2008.

7. World Health Organization (2007) Emergency and essential surgery: Simple actions to make a difference. Available: http://www.who.int/eht/sps/en/index.html. Accessed 23 July 2008.
8. Chen L, Evans T, Anand S, Boufford JI, Brown H, et al. (2004) Human resources for health: Overcoming the crisis. Lancet 364: 1984-1990.
9. Ivers L, Garfein ES, Augustin J, Raymonville M, Yang AT, et al. (2008) Increasing access to surgical services for the poor in rural Haiti: Surgery as a public good for public health. World J Surg 32: 537-542.
10. Bellagio Essential Surgery Group (2007) Increasing access to surgical services in resource-constrained settings in sub-Saharan Africa; 4-8 June 2007; Milan, Italy. Available: http://globalhealthsciences.ucsf.edu/bellagio/2007.html. Accessed 23 July 2008.
11. Kruk ME, Pereira C, Vaz F, Bergström S, Galea S (2007) Economic evaluation of surgically trained assistant medical officers in performing major obstetric surgery in Mozambique. BJOG 114: 1253-1260.
12. Pereira C, Bugalho A, Bergstrom S, Vaz F, Cotiro M (1996) A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique. Br J Obstet Gynaecol 103: 508-512.
13. ROUND UP (2007) Maternal mortality and morbidity: Non-physicians with surgical training carry out most emergency obstetric surgery safely in Mozambique and Malawi. Reprod Health Matters 15: 239-249.
14. Farmer PE, Kim JY (2008) Surgery and global health: A view from beyond the OR. World J Surg 32: 533-536.
15. Bellagio Essential Surgery Group (2008) 2nd Bellagio conference; 22-24 July 2008; Kampala, Uganda. Available: http://globalhealthsciences.ucsf.edu/bellagio/2008.html. Accessed 23 July 2008.
16. Brigham and Women's Hospital (2008) Disparities in surgical care: Research to practice; 27-28 October 2008; Boston, Massachusetts, United States. Available: http://www.brighamandwomens.org/CenterforSurgeryandPublicHealth/Documents/symposium.pdf. Accessed 23 July 2008.
17. World Health Organization (2005) Risking death to give life. The world health report. Available: http://www.who.int/whr/2005/chapter4/en/index1.html. Accessed 23 July 2008.
18. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, et al. (2005) Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: The ANRS 1265 Trial. PLoS Med 2: e298. doi:10.1371/journal.pmed.0020298
19. Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, et al. (2007) Male circumcision for HIV prevention in men in Rakai, Uganda: A randomised trial. Lancet 369: 657-666.
20. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, et al. (2007) Male circumcision for HIV prevention in young men in Kisumu, Kenya: A randomised controlled trial. Lancet 369: 643-656.
21. Gilbert CE, Shah SP, Jadoon MZ, Bourne R, Dineen B (2008) Poverty and blindness in Pakistan: Results from the Pakistan national blindness and visual impairment survey. BMJ 336: 29-32.
22. Javitt JC (1993) Cataract. In: Jamison DT, Mosley WH, Measham AR, Bobadilla JL, editors. Disease control priorities in developing countries. 1st edition. New York. Oxford University Press for the World Bank.
23. Borghi J, Hanson K, Acquah CA, Ekanmian G, Filippi V, et al. (2003) Costs of near-miss obstetric complications for women and their families in Benin and Ghana. Health Policy Plan 18: 383-390.
24. Mock CN, Gloyd S, Adjei S, Acheampong F, Gish O (2003) Economic consequences of injury and resulting family coping strategies in Ghana. Accid Anal Prev 35: 81-90.