Best Practice & Research Clinical Obstetrics and Gynaecology 29 (2015) 1092–1101

Contents lists available at ScienceDirect

Best Practice & Research Clinical Obstetrics and Gynaecology

journal homepage: www.elsevier.com/locate/bpobgyn

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Training non-physician mid-level providers of care (associate clinicians) to perform caesarean sections in low-income countries

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Keywords:
caesarean section
task shifting
maternal mortality
clinical audit
Mozambique
Tanzania

Comprehensive emergency obstetric care including major surgery such as caesarean section is a major health system problem in rural areas of poor countries, where there are no doctors. Innovative trainings of mid-level workforce have now demonstrated viable, scientifically valid solutions. Delegation of major surgery to duly trained 'non-physician clinicians' – 'task shifting' – should be seriously considered to address the human resources crisis in poor countries to cope with current challenges to enhance maternal and neonatal survival.

Nationwide, non-physician clinicians in Mozambique perform approximately 90% of caesarean sections at the district hospital level. A comparison between the outcomes of caesarean sections provided by this category and medical doctors, respectively, demonstrates no clinically significant differences. These mid-level providers have a remarkably high retention rate in rural areas (close to 90%). They are cost-effective, as their training and deployment is three times more cost-effective than that of medical doctors.

In the literature, 'non-physician mid-level providers of care' is most often referred to as 'non-physician clinicians' (with emphasis on 'clinicians'), abbreviated NPCs or more recently and more adequately without the inherent negation of 'non-': *associate clinicians* (ACs).

Who are these NPCs/ACs? Studies and commentators differ in their inclusion or exclusion of traditional health professional cadres, including nurses, midwives, pharmacists and other allied health professionals, who have distinct and complementary clinical roles to play. We focus here on the role of NPCs/ACs in Comprehensive Emergency Obstetric Care (CEmOC) and other surgical services in sub-Saharan Africa (SSA) in situations characterized by physician shortages. These cadres have been central

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http://dx.doi.org/10.1016/j.bpobgyn.2015.03.016
1521-6934/

to the debate about ensuring adequate staffing for essential surgery and other physician-delivered services in such environments, although a growing interest has been expressed in the greater use of midwives and nurse–midwives in obstetric surgery, and countries have been building on their experiences in such expanded uses [1,2].

Many indicators demonstrate that surgery will play an increasingly important role in global health in the near future. The so-called epidemiological transition replaces the burden of infectious disease by chronic diseases, and a worldwide increase in technical innovation and road traffic leads to an increase in trauma-related injuries [3].

The key obstacle to overcoming the prevailing problematic scenario is the scarcity in health staff. SSA is most affected by the global shortage of human resources for health [4–6]. Two countries to be addressed as examples more in detail here, Mozambique and Tanzania, experienced this crisis some years ago [5,7,8]. In other countries, despite years of interventions to overcome the scarcity of doctors, the shortage has worsened as a result of population growth, presenting a major challenge to the ability of these countries to achieve the health-related Millennium Development Goals (MDGs) [7,9].

A major reason for SSA's high maternal mortality is that few infants are born in the presence of skilled attendants. The lack of skilled birth attendants contributes to the five to six million maternal deaths, stillbirths and newborn deaths each year worldwide. Ideally, a skilled birth attendant, also mastering CEmOC, has to undergo training in surgery in order to perform CS safely.

Basic surgical procedures at the district hospital level in low- and middle-income countries (LMICs), according to a recent systematic review, are cost-effective; provision of both emergency and trauma surgery at larger hospitals were found to be highly cost-effective [10].

The poorest third of the world's population receive only 3.5% of surgical interventions undertaken worldwide, suggesting huge unmet needs in the surgical disease burden of LMICs [3]. Caesarean section (CS) is the most commonly performed major surgical operation at the district hospital level in the SSA region [11].

The so-called 'optimum' population need for CS is often said to be somewhere between 5% and 10% of all deliveries. This proportion is, however, debatable [12]. Nevertheless, there is no doubt that access to such care is grossly inadequate in many sub-Saharan countries. A study investigating CS rate globally found that 27 sub-Saharan countries had rates below 5%. Among these, 13 countries had rates below 2% [12]. In a household study from Sierra Leone, 25% of respondents reported a surgical condition needing attention, and 25% of deaths of household members in the previous year might have been avoided if timely surgical care had been provided [13].

The AIDS epidemic in SSA may have aggravated the non-accessibility of CSs by depriving health systems of a significant proportion of their trained staff [14]. SSA accounts for 11% of the world's population and 24% of the total estimated global burden of disease; yet it has only 3% of the global health workforce [14], only a small percentage of whom are qualified surgeons. SSA has <1% of the number of surgeons that the United States has, despite having a population that is three times as large [15].

At the district hospital level, building surgical capacity for CSs is often regarded as the most effective means to improve access to emergency obstetric care and essential surgical care in SSA. The majority of the population in SSA reside in rural areas [16], and the district hospital provides the point of entry to surgical care for most of these people [17]. Women with obstetric complications may not be able or willing to travel long distances, or they cannot afford the treatment provided at a higher level-facility. The lack of qualified staff is one of the main obstacles towards provision of basic surgical services at district hospitals in SSA [18].

There are several programmes and policies aiming at improved delivery of emergency obstetric care to rural dwellers, including surgical camps, specialist outreach and decentralization of services [19]. Poor sustainability has been a major concern for many of these alternatives, and it is also an important problem when it comes to employing medical doctors in rural areas.

A well-functioning practice of CEmOC in rural areas requires prospective information about the availability of recently graduated young medical doctors and their career intentions. Burch and colleagues investigating a wide range of SSA countries could show that although 20% of medical students wanted to specialize in surgery, only 4.8% intended to practise in rural areas [20]. As many as 21% of the students planned to relocate outside SSA, in search of better reimbursement and professional opportunities. The authors concluded that the career intentions of African medical students were not