

Scarcity of healthcare worker protection in eight low- and middle-income countries: surgery and the risk of HIV and other bloodborne pathogens

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Abstract

OBJECTIVE In view of the substantial incidence of bloodborne diseases and risk to surgical healthcare workers in low- and middle-income countries (LMICs), we evaluated the availability of eye protection, aprons, sterile gloves, sterilizers and suction pumps.

METHODS Review of studies using the WHO Tool for the Situational Analysis of Access to Emergency and Essential Surgical Care.

RESULTS Eight papers documented data from 164 hospitals: Afghanistan (17), Gambia (18), Ghana (17), Liberia (16), Mongolia (44), Sierra Leone (12), Solomon Islands (9) and Sri Lanka (31). No country had a 100% supply of any item. Eye protection was available in only one hospital in Sri Lanka (4%) and most abundant in Liberia (56%). The availability of sterile gloves ranged from 24% in Afghanistan to 94% in Ghana.

CONCLUSION Substantial deficiencies of basic protective supplies exist in low- and middle-income countries.

keywords bloodborne diseases, HIV/AIDS, surgery, occupational health

Introduction

In sub-Saharan Africa, HIV prevalence rates in the general population range from 1% to 2% in West Africa to more than 20% in parts of Southern Africa (UNAIDS 2010), and the rates among surgical patients are even greater (Kingham *et al.* 2009b). The percentage of the population with chronic hepatitis B virus infection exceeds 8% (Teshale 2011), and the estimated prevalence of hepatitis C virus infection ranges from 1.6% in Southern and East Africa to 6% in Central Africa (Madhava *et al.* 2002).

As part of their daily routine, surgical healthcare workers are frequently at risk for exposure to patients' blood and body fluids, and the risk to such personnel in low- and middle-income countries (LMICs) is even greater (Fry 2007; De Silva *et al.* 2009; Mohebbati *et al.* 2010). This problem is compounded by the scarcity of resources in these countries that make it difficult for surgical healthcare

workers to access protective gears (Consten *et al.* 1995; Kingham *et al.* 2009b). It is well established that precaution based on the adequate knowledge and utilization of appropriate protective gear is a key to protecting the healthcare workers from potential exposure to these contagions. Particularly important is the use of protective items such as gloves, aprons and eye protection (CDC 1988). Current evidence suggests that using such items significantly reduces the risk of infection and safeguards occupational health, with several studies showing splash rates of more than 40% onto protective masks and glasses during operations (Mast *et al.* 1993; Marasco & Woods 1998; Sharbaugh 1999; Calfee 2006; Olapade-Olaopa *et al.* 2006; Davies *et al.* 2007).

The aim of this study was to review recently published data from various LMIC hospitals and document the availability of equipment and supplies for the protection of healthcare workers. We hypothesized that the quantity of

protective items supplied to these hospitals was inadequate for such a high-risk population.

Methods

The WHO Tool for Situational Analysis for Access to Emergency and Essential Surgical Care (WHO 2008) was developed in 2008 to document the surgical capacity of health facilities in LMICs. The tool captures data on the availability of infrastructure, personnel and surgical procedures that can be performed as well as on supplies and equipment. Investigators are asked to categorize the availability of these items into one of the following three groups: always available, infrequently available, not available. The tool has been successfully used for surgical capacity assessment in several LMICs, and a number of articles documenting the needs of health facilities based on the tool have been published.

For this paper, we identified all published literature where the tool was used. We then collected data from each paper to investigate the number of hospitals in each country and the availability of the following five protection gears in each of those hospitals: eye protection, aprons, sterile gloves, sterilizers and suction pumps. The data on the availability of the protection gears were re-categorized into two rather than three categories, stating that facilities either have the equipment available 'all the time' or 'not all the time'.

Results

Eight studies that utilized the WHO survey tool for the surgical capacity assessment in individual countries have been published. The studies cover Afghanistan (Contini *et al.* 2010), the Gambia (Iddriss *et al.* 2011), Ghana (Choo *et al.* 2010), Liberia (Sherman *et al.* 2011), Mongolia (Spiegel *et al.* 2011), Sierra Leone (Kingham *et al.*

2009a), the Solomon Islands (Natuzzi *et al.* 2011) and Sri Lanka (Taira *et al.* 2010).

In total, 164 hospitals were investigated: 17 in Afghanistan, 18 in Gambia, 17 in Ghana, 16 in Liberia, 44 in Mongolia, 12 in Sierra Leone, 9 in the Solomon Islands and 31 in Sri Lanka (Table 1). The investigators in the Gambia, Liberia, Sierra Leone and Solomon Islands conducted field assessment work in the majority of hospitals located in the countries, while those in Afghanistan, Ghana, Mongolia and Sri Lanka used a representative sample.

In Afghanistan, the availability was not reported for each individual item for each hospital; instead, the authors stated that equipment and supplies for basic surgical emergencies were uniformly available in four regional hospitals, incompletely or only occasionally available in six provincial and in five district hospitals. Thus, for the five protective items analysed here, we assumed that deducing from the author's report these items were 'always available' in only 24% of facilities surveyed.

In Ghana, 94% of facilities had consistent supplies of sterile gloves. Sterilizers were readily available in approximately 80% and suction pumps in 70%.

In Sri Lanka, where 31 hospitals were surveyed, some facilities failed to respond to all questions. Based on the reports of those who did responded to all questions relating to the five protective items, eye protection was always available in only 5% of facilities; sterile gloves were available in 55% and sterilizers in 65% of the 22 facilities that responded to the respective question.

In sum, none of the eight countries had a 100% supply of all five items (Table 2). Aprons were available in 24% of the hospitals surveyed in Afghanistan, in 33% in the Gambia and in 63% in Liberia. Eye protection was available in only one hospital in Sri Lanka (4%), and even in Liberia, which reported to have them available in the largest percentage of the facilities, only 56% responded that they had sufficient supplies. The availability of sterile gloves greatly varied, ranging from 24% in Afghanistan to 94% in Ghana. Likewise, the availability of sterilizers ranged from 24% in Afghanistan to 92% in Sierra Leone. Lastly, the availability of suction pumps was relatively low, with 24% in Afghanistan, 71% in Ghana, 9% in Mongolia and 44% in the Solomon Islands.

Discussion

Our study highlights the limited resources devoted to protecting healthcare workers from the occupational hazard of HIV infection in LMICs. Such deficiency is not confined to healthcare workers – patients can also potentially be exposed to HIV contagion during medical

Table 1 Individual countries with published surgical capacity assessments and number of hospitals assessed

Country (reference)	Number of hospitals assessed
Afghanistan (Contini <i>et al.</i> 2010)	17
Gambia (Iddriss <i>et al.</i> 2011)	18
Ghana (Choo <i>et al.</i> 2010)	17
Liberia (Sherman <i>et al.</i> 2011)	16
Mongolia (Spiegel <i>et al.</i> 2011)	44
Sierra Leone (Kingham <i>et al.</i> 2009a)	12
Solomon Islands (Natuzzi <i>et al.</i> 2011)	9
Sri Lanka (Taira <i>et al.</i> 2010)	31
Total	164

Table 2 Number and percentage of hospitals which always have protective supplies and equipment by individual country

	Afghanistan (<i>n</i> = 17)	Gambia (<i>n</i> = 18)	Ghana (<i>n</i> = 17)	Liberia (<i>n</i> = 16)	Mongolia (<i>n</i> = 44)	Sierra Leone (<i>n</i> = 12)	Solomon Islands (<i>n</i> = 9)	Sri Lanka (<i>n</i> = 31)
Apron	4 (24)*	6 (33)		10 (63)				
Eye protection	4 (24)*	3 (17)		9 (56)	4 (9)	5 (42)		1 (5)†
Gloves (sterile)	4 (24)*	10 (56)	16 (94)	10 (63)	35 (80)	9 (75)	8 (89)	12 (55)‡
Sterilizer	4 (24)*	9 (50)	14 (82)		18 (41)	11 (92)	7 (78)	14 (64)‡
Suction pump	4 (24)*		12 (71)		4 (9)		4 (44)	

Data given in parenthesis are expressed as percentage.

*Equipment and supplies were only uniformly available at four regional hospitals.

†Denominator of 20 was used.

‡Denominator of 22 was used.

procedures and are left without any means to protect themselves from such exposure.

Occupational risks related to bloodborne diseases for surgeons or surgical practitioners are well documented: Consten *et al.* (1995) reported that 22.3% of 1078 patients who underwent surgical procedures in Zambia were HIV positive and that there was a 1% rate of parenteral exposure in the course of 1161 procedures. Surgical patients are more likely to be HIV positive than the general population, and therefore healthcare workers treating surgical patients should be considered a high-risk population (Consten *et al.* 1995; Lewis *et al.* 2003; Mkony *et al.* 2003; Kedir 2008; Kingham *et al.* 2009b). Consten *et al.* (1995) estimated that if a surgeon were employed for 5 years in Zambia, the cumulative risk of contracting HIV would be 1.5%, assuming an average of three exposures per year.

Obi *et al.* (2005) surveyed 264 randomly selected surgical trainees or practicing surgeons at five facilities in Nigeria and found that in the previous 5 years, 40.2% (*n* = 106) of the surgical trainees and 26% (*n* = 70) of the practicing surgeons reported at least one needle-stick injury and at least one incident of blood splashes during surgery. Moreover, 89% of the 236 healthcare workers surveyed were engaged in the risky practice of routinely operating on patients with open hand wounds; these wounds were subsequently contaminated with blood in 5% of the cases. During surgical procedures, all respondents wore protective aprons, but only 65.2% were double-gloved and only 30.3% used protective goggles. A study in Australia examined 160 eye shields that were consecutively used by surgeons and surgical assistants in Melbourne (Marasco & Woods 1998). It found that 44% tested positive for blood, although the surgeons themselves were only aware of the occurrence of any spray episodes in 8% of cases.

Constant supplies of the protective items investigated in this study would likely greatly reduce the risk of exposure

for surgical healthcare workers. A laboratory experiment based on animal testing demonstrated that the use of gloves reduces the volume of blood transmitted to the underlying skin by approximately 50% during a needle-stick injury (Mast *et al.* 1993). Wearing two pairs of latex gloves reduces the risk of exposure caused by glove defects from approximately 17% to 5% (Gerberding *et al.* 1990).

Nevertheless, these items are frequently not affordable in LMICs. Aisien and Ujah (2006) documented that 60% of respondents in Nigeria who did not use the protective items during surgical procedures cited the lack of supplies as their primary reason for not doing so, as did 85% of surgical trainees in Nigeria (Adebamowo *et al.* 2002).

While the availability of HIV protective equipment is essential to the delivery of safe surgical care and the protection of both patients and providers, ensuring that healthcare providers are properly trained in the use of surgical safety equipment and aseptic techniques is also important. The lack of surgical equipment alone cannot entirely account for the proper use of equipment and the importance of safety protocols in the event of an involuntary exposure. Primary preventive measures (training, protective equipment) as well as secondary prevention of possible infections with prophylactic post-exposure drugs are important.

One initiative that addresses the lack of surgical workforce protection is the Surgery and HIV Assessment and Response Program (S.H.A.R.P) of Surgeons OverSeas. This programme aims to provide local workers with protective gear to prevent the spread of HIV/AIDS, hepatitis and other bloodborne diseases, by locally procuring HIV protective equipment and providing it to government health facilities. An advocacy campaign is calling for legislation to provide such safety equipment for all healthcare workers, and recently, a seminar on health and safety in the surgical workplace was conducted in Free-town, Sierra Leone.

Each country will likely have a different mechanism of supply and distribution. There are no available data on whether supplies are provided through the government or privately, although from anecdotal experience we suspect it is a combination of both. It is not known whether the lack of protective surgical supplies limits the availability of surgical services.

Protection during surgical procedures is equally important to healthcare providers and the patients they are treating, because bloodborne pathogens can be transmitted either way. In a study of accidental blood exposures in three West African nations, healthcare providers only reported approximately 30% of all blood exposures (Tarantola *et al.* 2005). An even higher estimate of 40–70% for the underreporting of needle-stick injuries is proposed (Wilburn 2004). Stigma and hesitation may play a role in influencing a surgical healthcare provider's decision to report an exposure. The stigma among healthcare workers who acquired HIV through occupational exposure cannot be ignored, and HIV rates among healthcare workers are probably underreported. A survey of South African surgeons revealed mixed views on reporting HIV status to colleagues, patients and hospital administration, with most favouring non-disclosure (Szabo *et al.* 2009). Knowledge about exposure risks and formal reporting protocols and systems for post-exposure prophylaxis may be lacking. Several studies have indicated that providers require further education and training on protective and post-exposure prophylactic measures (Chogle *et al.* 2002; Nwankwo & Aniebue 2011). Providers who are not aware of their own HIV sero-status or exposure to other bloodborne infections may further increase the risk of infection of both patients and other healthcare providers.

Limitations

Our study has a number of limitations. Firstly, not all data were reported for all the items for all of the countries. Even though all surveys used the same assessment tool, because different investigators conducted them without consultation with each other, their reports lacked consistency. Owing to the missing or unreported data in some of the studies, some assumptions needed to be made. Notably, data from Ghana, Afghanistan, Mongolia and Sri Lanka came from a representative sample of hospitals, while data from the Gambia, Liberia, Sierra Leone and Solomon Islands were collected at all facilities. Secondly, the general descriptive nature of WHO survey tool may inadequately represent data. For instance, in facilities where supplies are not 'always available', it is difficult to quantify the frequency of availability. Supplies

that were 'infrequently available', which we re-categorized together with the 'not available' into 'not always available' could refer to broad range of product availability not accounting for seasonal or temporal variations in supply. Therefore, in our presentation of the data into binary categories of 'always available' and 'not always available', we may have skewed the original data by over- or underestimation. Thirdly, the WHO survey tool only provides a snapshot of data and does not provide any information on the trend of rising or falling availability of supplies over time. Fourthly, there is no indication from each study as to whether all hospitals included in the assessment actually provide surgical care. This can introduce significant bias, as those hospitals that do not will naturally not stock as many surgical supplies, although some items such as sharps disposals and gloves are considered universal precaution items and should be available in every healthcare facility.

Conclusion

There is a substantial deficiency of basic supplies of protective gears in LMICs even though these items are essential for protecting surgical healthcare workers against bloodborne diseases. To ensure a sustainable supply of these items for the workers, governments as well as global donor agencies must establish a policy that requires provision of these items for health workers and secure funding to do so.

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