

Unsafe injections in low-income country health settings: need for injection safety promotion to prevent the spread of blood-borne viruses

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SUMMARY

Injections are one of the most frequently used medical procedures. The World Health Organization (WHO) estimates that 12 billion injections are given annually, 5% of which are administered for immunization and 95% for curative purposes. Unsafe injection practices (especially needle and syringe re-use) are commonplace in low-income country health settings, and place both staff and patients at risk of infection with blood-borne viruses (BBVs). It is estimated that up to 160 000 human immunodeficiency virus (HIV), 4.7 million hepatitis C and 16 million hepatitis B infections each year are attributable to these practices. The problem is complex and fuelled by a mixture of socio-cultural, economic and structural factors. An appropriate

response on the part of international organizations, governments, health administrators, community organizations and health workers, including those who work in the area of HIV/AIDS prevention, has been slow to emerge. This paper reviews the literature relating to unsafe injection practices and the transmission of BBVs in low-income countries in order to raise awareness of the issue and the consequent need to promote injection safety messages amongst both consumers and providers of health care services in these countries. The nature and extent of unsafe injection practices, the burden of blood-borne viral illness attributable to unsafe injection practices, and the factors contributing to these practices are summarized, and possible strategies for promoting injection safety discussed.

Key words: blood-borne viruses; HIV/AIDS; injection safety; low-income countries

INTRODUCTION

Unsafe injection practices coupled with the popular and sometimes unnecessary use of injections in low-income countries is a complex public health problem that contributes to the burden of preventable blood-borne viral disease, including HIV infection. [Low-income countries are those classified as such by the World bank on the basis of their 1999 GNP per capita (US\$755 or less) and include most of Africa, the Indian subcontinent, some South-East Asian countries and Mongolia. High-income countries such as North America, Western Europe, Japan and Australia have a GNP per capita of US\$9266

or more (World Development Report, 2000/2001).] A response to this problem on the part of international organizations, governments, health administrators, community organizations and health workers, including those who work in the area of HIV/AIDS prevention, has been slow to emerge. In recognition of this problem, in 1999 the World Health Organization (WHO) convened the Safe Injection Global Network (SIGN), which aims to promote the safe and appropriate use of injections worldwide. SIGN associates include the United Nations Children's Fund (UNICEF), the Centers for Disease Control and Surveillance (CDC; Atlanta, GA), the United States Agency for International

Development (USAID), non-governmental organizations (NGOs), governments, universities, health worker organizations and industry groups (Hutin and Chen, 1999).

The risk of nosocomial infection with blood-borne viruses (BBVs) as a consequence of unsafe injection practices was recognized in high-income countries in the middle of last century, and was brought into sharper focus by the advent of HIV/AIDS in the 1980s (Kibbler, 1997; Hutin and Chen, 1999). Reusable glass syringes and re-usable needles were replaced by disposable plastic syringes and single-use needles during the 1950s and 1960s, and for decades the use of a new, disposable, sterile needle and syringe for each and every injection has been standard practice (Drucker *et al.*, 2001). Infection control policies, guidelines and practices to enhance the safety of patients and health workers have been widely researched, implemented and evaluated. Consequently, the risk of nosocomial BBV infection due to unsafe injection practices in high-income countries is extremely small.

In low-income countries, unsafe injection practices are comparatively common (see Table 1), placing both patients and health workers at risk of infection with BBVs such as hepatitis B

(HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV) (Wyatt, 1986; Soeters and Aus, 1989; Hutin and Chen, 1999). Patients are at risk because both single-use disposable and re-usable needles and syringes are re-used, and the methods employed to clean and sterilize the equipment between patients are often sub-optimal, if used at all. Potential health gains attributable to interventions such as childhood immunization programmes are jeopardized by these practices. Health workers are at risk because they are required to handle used injecting equipment in order to clean and sterilize it for re-use.

This paper reviews the literature relating to unsafe injection practices and the transmission of BBVs in low-income countries in order to raise awareness of the issue, and the consequent need to promote injection safety messages amongst both consumers and providers of health care services in these countries. The National Library of Medicine (NLM) databases (up until June 2002) were searched, as were the reference lists of all publications obtained (>160 publications). A thorough Web-based search was also undertaken. The nature and extent of unsafe injection practices, the burden of blood-borne viral illness attributable to unsafe injection practices, and the factors contributing to these practices are summarized, and possible strategies for promoting injection safety discussed.

Table 1: Field observation in Indonesia

Puskesmas (health centre), Central Java, Indonesia,
10 November 1990, 09:00

A nurse dressed in her official nurses' uniform decorated with Golkar symbols addresses her question in a commanding tone of voice: 'injection?', to an elderly woman, already the tenth patient of today.

Simultaneously she points her finger to a plastic curtain, dividing the space in two. The old woman follows her instructions and hurried along by the auxiliary nurse, disappears behind the curtain and unfastens the long sash that holds her wrap around her batik skirt. When the woman has finally managed with difficulty to climb on to the high iron bedstead, the needle has already entered the upper part of her buttock with precision. The skin is swiftly rubbed with a piece of cotton. Then she descends from the bed and walks to the adjoining room to pay. A man is already awaiting his turn, with his trousers slightly undone. The assistant swivels the glass syringe with some water and prepares it for the following patient. She picks up one of the medicine bottles from the table, and partly fills the syringe with a solution. Next to the bottles stands an uncovered sterilizing pan with four to five needles. Several more patients will be injected before the needle of the syringe is changed.

Taken from Sciortino (1993).

UNSAFE INJECTION PRACTICES

An injection is a skin-piercing event performed to introduce a substance into the body for prophylactic, curative or recreational purposes. Injections are one of the most frequently used medical procedures. The WHO estimates that ~12 billion injections are given annually, of which 5% are administered for immunization and 95% for curative purposes. A safe injection is defined as one that does not harm the recipient, expose the health worker to avoidable risk, or result in waste that puts other people at risk (Simonsen *et al.*, 1999; WHO, 1999). [Unsafe disposal of needles and syringes contributes to environmental degradation, and in resource-constrained health settings is a problem with no easy solution. However, this important aspect of injection safety is not the focus of this paper.]

A range of injection practices considered unsafe for patients and/or health workers (and

Table 2: Unsafe injection practices

Inappropriate and overuse of injectable medications
Re-using disposable needles and syringes
Loading syringes with multiple doses and injecting many people consecutively
Using one syringe for many patients, while changing the needle for each patient (a practice used in some childhood immunization programmes)
Using multi-dose vials pierced with a single drawing-up needle
Flaming needles between patients
Re-capping needles
Flushing needles and/or syringes with disinfectant or water to clean them after use or between patients
Not discarding the needle immediately after use, at the place of use
Leaving contaminated sharps to be disposed of by someone other than the user
Separating the needle from the syringe prior to disposal
Bending the needle after use to eliminate the risk of re-use
Placing hands into containers of used needles, for cleaning or sorting purposes
Soaking used needles and syringes in sodium hypochlorite solution
Inadequately monitored needle and syringe cleaning and sterilization practices
Sharpening needles for re-use
Discarding needles and syringes into the general waste system
Collecting used needles and syringes for resale

others such as cleaners and scavengers) are identified in Table 2. These unsafe practices rarely occur in high-income countries, but are often evident in low-income country health settings. In high-income countries, therapeutic injections are nearly always given by trained allopathic health care providers in health settings. In contrast, the administration of injections in low-income countries takes place in a variety of settings, and involves a range of providers. These settings are summarized below:

- Formal (government and private): allopathic doctors, nurses and other health workers who are trained to administer injections and authorized by the state to do so.
- Informal: untrained providers whose practice is not institutionalized, and who are not authorized by the state to give injections. They are sometimes referred to as 'injectionists', 'injection doctors', 'needlemen' or 'quacks'.
- Traditional: healers who may or may not be recognized by the state through associations, and are often trained by apprenticeship to other healers.
- Domestic: injections administered in the home by relatives and neighbours as a favour or expression of care. Generally no payment is involved (Reeler, 1990; Reeler, 2000).

Simonsen and colleagues undertook a comprehensive review of all identifiable studies and reports related to injecting practices in 19 low-income countries, and based on the findings estimated the proportion of unsafe injections (Simonsen *et al.*, 1999). An unsafe injection was narrowly defined as 'one in which the syringe, needle or both, have been re-used without sterilisation' [(Simonsen *et al.*, 1999), p. 790]. For 14 of the countries, at least 50% of injections given were considered unsafe.

Unsafe injection practices have been reported from many countries, including India (Lakshman and Nichter, 2000), Pakistan (Khan *et al.*, 2000), Burkina Faso, Senegal and Cote d'Ivoire (Dicko *et al.*, 2000), Indonesia (Hogeboom van Buggenum *et al.*, 1993) and Nepal (Bhattarai and Wittet, 2000). It is highly probable that unsafe injection practices are also prevalent in other low-income countries.

Unsafe injection practices place not only patients at risk of infection with BBVs, but also health workers. Doctors and nurses in low-income countries, where the prevalence of BBV infection is high and infection control standards are often poor, are frequently exposed to the blood of others in the course of their work, most commonly as a consequence of needlestick injuries (Adegboye *et al.*, 1994; Consten *et al.*, 1995; Gumodoka *et al.*, 1997). However, occupational safety of health workers in low-income countries is a neglected issue, as highlighted by the following quote:

Seventy per cent of the world's HIV-infected population lives in sub-Saharan Africa, but only 4% of worldwide cases of occupational HIV infection are reported from this region. By contrast, 4% of the world's HIV-infected population lives in North America and western Europe, yet 90% of documented occupational HIV infections are reported from these areas. It is unlikely that surveillance and reporting of occupational exposure to infected blood will be undertaken in places where postexposure prophylaxis, treatment, and workers' compensation are lacking. [(Sagoe-Moses *et al.*, 2001), p. 538.]

Burden of disease attributable to unsafe injection practices

The use of injections in low-income country health settings is common practice. The estimated number of injections per person per year amongst a sample of 13 low-income countries ranged between 1.2 (in Tanzania and India) and 8.5 (in Pakistan), with a median of 1.5. For eight of these countries, 25–96% of outpatient visits resulted in at least one injection, and for five of these countries 70–99% of the injections given were judged to be unnecessary. The most common parenteral medications are vitamins, antibiotics, analgesics and quinine, which are sometimes given inappropriately for upper respiratory disease, diarrhoea, fever or general fatigue (Simonsen *et al.*, 1999; Reeler and Simonsen, 2000).

Acknowledgement of the contribution made by unsafe injection practices to the transmission of BBVs in low-income countries has been slow to emerge. Most infections caused by unsafe injections are likely to go unnoticed because they are rarely associated with symptoms at the time of infection, or the symptoms are rather non-specific. The long incubation period between the time of infection and the development of sequelae (such as liver cirrhosis, liver cancer and AIDS) means that the connection between the disease and an injection given months or years earlier is unlikely to be made, especially when injections are such commonplace events in peoples lives. This problem is compounded by a lack of disease surveillance in many low-income countries (Simonsen *et al.*, 1999).

Drucker and coworkers suggest that the rapid growth in demand for injectable medications combined with unsafe injection practices may have facilitated the advent of HIV/AIDS in Africa during the middle part of last century (Drucker *et al.*, 2001). They hypothesize that unsafe injection practices have the potential not only to amplify the transmission of BBVs, but also to foster the creation of new pathogens. Unsafe injection practices make possible the rapid serial passage of otherwise innocuous organisms (e.g. simian immunodeficiency virus) from person-to-person, thereby potentially facilitating the emergence of new organisms with enhanced pathogenicity (e.g. HIV). If this theory is correct, then the possibility of other pathogens emerging as a consequence of unsafe injection practices must be considered, further highlighting the urgency of enhancing injection safety in low-income countries.

The most powerful example of the link between unsafe injection practices and a high burden of disease is provided by Egypt, where the prevalence of HCV infection in the general population is 15–20% as a consequence of large-scale campaigns undertaken up until the 1980s for the treatment of schistosomiasis, which was endemic in many parts of the country. The treatment consisted of 12–16 injections of potassium antimony tartrate, and commonly involved the re-use of unsterile needles and syringes (Frank *et al.*, 2000). Findings from a range of studies support the link between HCV seropositivity in Egypt and a history of treatment for schistosomiasis (El-Sayed *et al.*, 1996; Abdel-Aziz *et al.*, 2000; Nafeh *et al.*, 2000; Darwish *et al.*, 2001).

A variety of other countries have also reported BBV infections in association with unsafe injection practices, including India (Rao and Shahi, 1987; Narendranathan and Philip, 1993; Singh *et al.*, 1998; Chowdhury *et al.*, 1999; Singh *et al.*, 2000), Pakistan (Luby *et al.*, 1997; Pasha *et al.*, 1999; Khan *et al.*, 2000), Tanzania (Hoelscher *et al.*, 1994), Sudan (McCarthy *et al.*, 1989), Libya (Yerly *et al.*, 2001), Taiwan (Ko *et al.*, 1991; Wang *et al.*, 1998), Romania (Hersh *et al.*, 1991) and Moldova (Hutin *et al.*, 1999).

The number of HBV, HCV and HIV infections attributable to unsafe injection practices (defined as the re-use of a syringe or needle from patient to patient without sterilization) in low-income countries has been calculated as 8–16 million HBV, 2.3–4.7 million HCV and 80 000–160 000 HIV infections globally every year (Kane *et al.*, 1999). The World Health Report (2002) reports that unsafe injection practices account for 30% of HBV infections, 31% of HCV infections, 28% of liver cancer, 24% of cirrhosis cases, 5% of HIV infections and 0.9% of deaths worldwide (WHO, 2002). As well as the burden of morbidity and mortality, it is possible to calculate the burden of costs and years of life lost due to unsafe injection practices. Miller and Pisani estimate a global financial cost of US\$535 million per year, and calculate that unsafe injection practices are associated annually with 1.3 million deaths and 26 million years of life lost (Miller and Pisani, 1999).

Factors contributing to unsafe injection practices

The reasons for unsafe injection practices in low-income countries are complex and involve a combination of socio-cultural, economic and structural factors.

In many low-income countries there is a perception that injections are superior (more efficacious and faster acting) to oral medication (Wyatt and Mahadevan, 1993; Reeler, 2000; Raglow *et al.*, 2001). In some places, the rituals surrounding preparation and administration of injections, including the experience of pain, enhances belief in their power to heal (Nwokolo and Parry, 1989; Reeler, 2000). In Uganda there is a trend for families to keep needles and syringes at home for use when a family member requires an injection. This practice is motivated by the belief that it is safer to share injecting equipment with family members and friends than it is to use the injecting equipment provided by public hospitals where strangers, who possibly have HIV infection, are treated. Knowing who has previously used your injecting equipment is perceived as a way of taking control (Birungi, 1998).

Health workers are also influenced by popular socio-cultural perceptions of injections, as well as having their own 'professional' beliefs that potentially contribute to the overuse of injections. In low-income countries, allopathic, traditional and informal health care providers all prescribe injectable treatments, and many subscribe to the idea that compliance is better with injections than with oral medication (Hogeboom van Buggenum *et al.*, 1993; Janszen and Laning, 1993). Health workers also believe that patients want injections, and if injections are not provided during a consultation, will seek health care elsewhere, which can mean loss of status and income for some health workers (Janszen and Laning, 1993). Sometimes there are financial incentives that encourage health workers to give injections in place of oral medication, i.e. an additional fee is charged for injection administration (Birungi, 1998; WHO, 1999; Reeler, 2000).

Health workers believe that patients want injections as part of the consultation (which may or may not be true), so they provide one, even though it may not be the most appropriate treatment option. As Sciortino points out, a lack of communication between patients and health care providers may be unnecessarily contributing to the overuse of injections:

Health workers give injections because they think that patients want them. Patients want injections because the health workers give them. The fact that health workers always give injections and patients, in their

role as passive receivers, hardly ever refuse them, nourishes their mutual expectations. Possible doubts by patients or health workers are not expressed in their daily communication. It is this vicious circle which keeps the practice going. [(Sciortino, 1993), p. 40.]

Health workers in low-income countries can be professionally and geographically isolated, making it difficult for them to learn about safe injection practices. Access to educational resources and opportunities for ongoing professional development are often limited. Additionally, the health structures required to effectively implement, monitor and evaluate changes in practice do not always exist.

It is possible in many low-income countries to buy a range of injectable medications over the counter or on the black market, which are injected by relatives, friends or informal health care providers (e.g. 'injection doctors' in market places) using unsterile injecting equipment that is frequently used for more than one patient (Wyatt, 1986; Wolffers and Bloem, 1993; Birungi, 1998; Bhattarai and Wittet, 2000; Reeler, 2000). Practices such as these facilitate the use of inappropriate medications purchased without medical consultation, administered by untrained personnel, using needles and syringes that are unlikely to be adequately cleaned or sterilized between users.

Clearly, the limited availability of financial resources in low-income country health settings affects their capacity to purchase and maintain an adequate supply of appropriate injecting equipment. Additionally, a lack of financial resources is often coupled with the complex issue of corruption, which means that money allocated for health care may not always be used for its intended purpose, and systems put in place to ensure patient and health worker safety can be easily subverted (e.g. health workers diverting supplies of new syringes and needles for use in their own private practice). Another feature of resource-constrained environments is the imperative to recycle anything and everything, which makes it understandably difficult to convince health workers to discard used disposable needles and syringes when they are not damaged and in scarce supply.

Certain structures common to most health settings in high-income countries (e.g. infection-control committees, quality assurance systems, occupational safety standards, patients rights, etc.) facilitate the implementation, monitoring

and evaluation of elaborate systems of infection control, including injection safety. These structural advantages are not routinely a feature of health settings in low-income countries. Other environmental factors necessary for injection safety include an adequate and reliable supply of water and electricity, and these are not always available in remote (and not so remote) areas of most low-income countries.

A range of factors, including the socio-cultural meanings patients and health workers ascribe to injections, inadequate understanding of the risks associated with unsafe injection practices, a lack of available, affordable and safe injecting equipment, and ready access to injectable medications combine to create a situation in which unsafe injection practices flourish (Reeler, 1990; Birungi, 1998; Lakshman and Nichter, 2000; Reeler, 2000; WHO Secretariat, 2000).

PROMOTION OF INJECTION SAFETY

A small number of interventions to improve injection safety have been developed and implemented in Tanzania (Vos *et al.*, 1998), Indonesia (Hadiyono *et al.*, 1996) and Burkina Faso (Logez, 2001), but the best way forward is yet to be determined. Injection safety can be improved by reducing the number of inappropriate injections given and/or by improving the sterility of the injecting equipment used. Interventions can target patients with the aim of reducing the demand for (unnecessary) injections and/or they can target health workers with the aim of improving prescribing practices as well as enhancing standards of injection delivery.

In 1999, WHO, UNICEF, the United Nations Population Fund (UNFPA) and the International Federation of the Red Cross and Red Crescent Societies (IFRC) called for the exclusive use of auto-disable (AD) syringes [AD syringes (with needles attached) are designed to automatically lock as soon as the injection is given, making it very difficult to re-use the device] in immunization programmes by the end of 2003, as a strategy for eliminating the re-use of injecting equipment (WHO/UNICEF/UNFPA, 1999). This approach to achieving injection safety is not without its critics, who argue that the exclusive use of AD syringes in immunization programmes in low-income countries will be difficult to sustain in the long-term (Battersby

et al., 1999a; Battersby *et al.*, 1999b). Additionally, even if this approach can be achieved and sustained, it will have little impact on injection safety overall, as 95% of injections are occurring in the curative sector. Other factors such as the availability, affordability and quality of the supplied injecting equipment (whatever the type) are also critical if injection safety in low-income countries is to be fully realized. The development of an appropriate technology (such as AD syringes) is only a small part of the response required.

One of the key strategies identified by SIGN for achieving injection safety is 'the dissemination of information, education and communication (IEC) materials and behaviour change campaigns targeting patients and health workers' (Hutin and Chen, 1999). Raising awareness of the issues amongst both consumers and providers of health care services is an important component of the response, and one in which existing HIV/AIDS awareness and prevention programmes could play a critical role.

Patients have a right to know about the risks associated with unsafe injection practices so that they can become more informed consumers of health care. It is possible that promoting community awareness of injection safety issues may result in a decrease in the demand for injectable therapies, and an increase in the demand for sterile disposable injecting equipment for each and every injection. Additionally, patients may preferentially consult health workers who practice safely. However, how best to raise awareness of injection safety issues in the general community without engendering fear that could result in subsequent refusal to receive essential life-saving injectable therapies, including immunizations, is yet to be established. Is it reasonable to expect patients, who may not be literate, to make the distinction between appropriate and inappropriate prescribing of injections? Similarly, how can they judge whether sterilization procedures are adequate? Patients enter into a relationship of trust with health care providers who are perceived to have knowledge and skills that patients lack, which is why they are being consulted in the first place. It makes little sense from the patient's perspective to hand over precious money to pay for advice from a trusted health care provider, and then ignore it.

While education of the community regarding unsafe injection practices may indeed make an effective contribution to the enhancement of

injection safety in low-income countries, focusing on health workers and the contexts in which they operate is arguably more likely to achieve the desired outcomes. Patients tend to comply with what health workers recommend, and are rarely empowered to question prescribed treatment (Reeler and Simonsen, 2000). Interventions targeting health workers can involve activities to raise awareness regarding the inappropriateness of some commonly prescribed injectable medications and the risks associated with unsafe injection practices for both patients and themselves.

Improving the occupational safety of health workers in low-income countries with respect to their own risks of BBV infection is likely to benefit not only health workers, but also their patients. Interventions to make health workers safer will also make patients safer. When health workers' awareness of injection safety issues is enhanced, they are more able to take a leadership role in educating the community and initiating relevant changes in policies and practices. Finally, and very importantly, if health workers feel safe in their workplace with respect to the risks of occupational BBV transmission, they are less likely to discriminate against patients known to be infected with BBVs, particularly HIV.

CONCLUSION

This review has highlighted the important contribution of unsafe injection practices to blood-borne viral disease transmission in low-income countries, and the consequent need for widespread promotion of injection safety messages amongst consumers and providers of health care services. Issues contributing to the problem are complex and include socio-cultural, economic and structural factors. The literature reporting implementation and evaluation of intervention programmes is scarce, but through the activities of SIGN is likely to increase in the future. An effective response to the problem of unsafe injection practices probably needs to be multi-faceted and to operate at a number of levels (international, national, local and individual). While discussion, debate and research regarding how best to achieve injection safety needs to be ongoing, one practical strategy achievable in the short-term is to incorporate injection safety messages into existing HIV/AIDS awareness and prevention programmes.

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