

Quantifying Infectious Waste Produced by HIV/AIDS, Malaria, and Tuberculosis Programs and the Needs for Injection Safety Equipment

There are currently no specific, published data quantifying the need for safe injection equipment or the amount of infectious sharps waste produced by testing and treatment programs for diseases such as HIV/AIDS, tuberculosis (TB), and malaria. With growing funding in these areas there is an increased need to ensure all programs are integrating safe injection approaches and equipment in order to prevent additional disease transmission through syringe reuse, needlestick injuries, and environmental degradation from improper management of health care waste (HCW).

Overview of injection safety

The greatest safety risks posed by syringes are their potential reuse. The World Health Organization (WHO) estimates that approximately 50 percent of people in less economically developed countries are exposed to the risk of unsafe injections through needle reuse in both immunization and curative services.ⁱ The secondary safety risk, which directly impacts health workers, is the potential of infection through accidental needlestick injuries during injection and waste disposal procedures. Because the risk level for disease transmission is based on quantity of blood as well as infectivity, the unsafe management of lancets and phlebotomy equipment used for diagnosis and treatment of diseases is particularly hazardous. Phlebotomy is considered by the US Centers for Disease Control and

Prevention (CDC) to be one of the highest risk procedures involving sharps, primarily because of the large-size needle bore (18–22 gauge) and the quantity of blood that may still be in the needle after use.ⁱⁱ

Sharps create a transmission route for HIV and other bloodborne infections, especially in countries with populations where these infections are highly endemic.ⁱⁱⁱ Improper management of injection waste also puts the community at risk of injury and infection.^{iv} Each of these factors contributes to the estimated 23.5 million new HIV, hepatitis B, and hepatitis C infections transmitted every year through unsafe injections.ⁱⁱⁱ The risk of infection also depends on the prevalence of bloodborne pathogens in the population.ⁱ According to the CDC, the average risk of HIV infection after a needlestick exposure to HIV-infected blood is 0.3 percent or 1 in 300. The average risk of hepatitis B infection after a needle stick exposure to hepatitis b-infected blood ranges from 6–30 percent. Even though the risk of seroconversion after needlestick is relatively low, injured health care workers may suffer disabling physical side effects from post-exposure antiviral medication, as well as severe emotional trauma as they await their test results.^v Ensuring adequate injection safety equipment and supplies and the safe management of the resulting HCW are recognized as crosscutting

issues that effect all programs using sharps and producing infectious waste.*

For many years the GAVI Alliance and The United Nations Children's Fund (UNICEF) have been procuring adequate supplies of safe injection devices and safety boxes for immunizations, yet immunizations account for only 5–10 percent of all injections given. Through programs funded by the President's Emergency Plan for AIDS Relief (PEPFAR), injection safety in the curative sector has been recognized as a critical concern. Efforts to prevent medical transmission of bloodborne diseases are crucial for supporting health worker safety, patient safety, and health systems strengthening. The PEPFAR-funded safe injection project (2004–2009) is the first large-scale effort to introduce injection safety equipment and support health care waste management (HCWM) as well as supply management and planning in curative settings. This project has shown that injection safety interventions can be highly effective in improving practices in curative settings, where up to 90 percent of all injections take place.^{vi}

Quantifying the equipment needs and resulting waste

PATH recognizes the need to quantify safe injection equipment needs and resulting infectious waste in order to advocate for injection safety as part of all health programs; in order to do so, more in-depth studies are needed. However, by reviewing the current treatment guidelines and making some general assumptions, initial estimates can be made. Below is a preliminary analysis by disease to quantify these needs, with the caveat that testing and treatment regimens vary in complexity depending on the patient and the diagnosis. This analysis is meant to be a starting point to build upon with further research.

* For the purposes of this paper the term "injection safety equipment" includes sharps used for injections, other blood-drawing equipment, and related sharps.

HIV/AIDS

WHO estimates that 3 million people are currently receiving antiretroviral therapy (ART) worldwide.^{vii} Each patient that is diagnosed as HIV positive at a testing center and enrolls in an ART program generates approximately 2 lancets, 3 needles, 25 vacuum blood collection devices, and 25 needles per year from first testing through the first year of treatment.^{viii} For 3 million people this results in approximately 6 million lancets, 75 million vacuum blood collection devices and 9 million needles per year. With an estimated additional 9 million people in need of ART, the resulting equipment needs and infectious sharps waste will increase significantly.

The numbers above are based on the assumption that a patient responds positively to treatment. From that pool of patients who are already receiving ART, a percentage of them (approximately two-thirds) will not respond positively to treatment or will present with complications and require hospitalization. Quantification of HCW generated from a hospitalized patient is even more challenging given the complexity and diversity of diseases that the patient can have.

Malaria

Present estimates of malaria case rates suggest that 350 million to 500 million clinical disease episodes occur annually. Approximately 60 percent of the cases and over 80 percent of the deaths from malaria occur in sub-Saharan Africa.^{ix}

In most countries, reported case rates represent only part of the actual total number of malaria cases since many people are treated at home or in private facilities that do not report to the national health information system.^{ix} This makes it difficult to estimate the injection equipment needs and the amount of waste produced by malaria interventions. However, in highly endemic countries such as those in sub-Saharan Africa, malaria accounts for 20 to 45 percent of hospital visits.^{ix} Although most cases of malaria

are treated with oral medications, a large percentage of patients present with complicated malaria or other conditions that aggravate their symptoms, requiring intravenous medications and hospitalization.^x Patients who require hospitalization will use 3 to 8 needles per day. These patients will need parasitological confirmation (blood draws) and second-line anti-malaria medications. WHO estimates that up to 80 million rapid tests for malaria were used last year, mostly in Africa.^{xi} The use of these rapid tests produced a minimum of 80 million lancets that required safe disposal.

Tuberculosis

WHO estimates that 9,200,000 new cases of TB occurred in 2006.^{xii} Although most of the therapy for TB is given orally and the recommended diagnosis method is a smear sputum, we can assume that for each TB patient treated at least two of the follow-up visits will require blood draws to monitor progress. Where injection safety equipment is available this would result in the need for up to 4 vacuum collection tubes and 4 needles per patient per year, requiring 21,600,000 vacuum tubes and needles annually. If patients do not respond to therapy and need hospitalization, the amount of waste produced per patient increases. Multidrug-resistant TB and co-infection add to the complexity of case management and amplify the need for injection safety equipment and proper disposal of HCW.

Impact on HCWM systems

Countries where malaria, HIV/AIDS, and TB are more endemic are usually places where the health system is already challenged. These resource-constrained areas also face other challenges related to health system infrastructure such as disposal of medical waste. This situation can predispose the community to high environmental risks and patients and health care workers to biological accidents, particularly if sharps and infectious waste are not being disposed of properly.

One unintended consequence of increasing coverage and number of patients treated for HIV/AIDS, TB, and malaria is the increasing amount of sharps and infectious waste generated by these vertical programs. This consequence leads also to a higher demand for financial and human resources for the treatment of waste. If these considerations are not taken into account, the amount of waste produced by vertical programs could easily overwhelm health systems that in most cases are already challenged. Some programs that have the financial resources are installing parallel HCWM systems using autoclaves and high-temperature incinerators, particularly for treatment of highly infectious waste from laboratory activities.

The scale-up and increase in coverage requires a commitment to integrating crucial aspects into the health system such as injection safety and waste management, both of which affect the safety of health workers, patients, and the community. As a major step for waste management an emphasis on training of segregation of medical waste from the point of origin should be a key component of any scale-up program that generates medical waste.

A recognized component of any health care program is to guarantee adequate supplies of necessary equipment to ensure that patients and health care workers have appropriate means to safely receive and give care. A lack of injection safety equipment puts patients, health workers, and the entire community at risk of infection from syringe reuse and exposure to bloodborne diseases through improper disposal of infectious waste.

In resource-poor settings, staff at all levels may not have proper training or awareness in administering safe injections. Health facilities may not have adequate supplies of needles, syringes, and safety boxes, or may lack a proper disposal system for infectious medical waste. Each of these factors contributes to the estimated 23.5 million new HIV, hepatitis B, and hepatitis C infections transmitted every year through

unsafe injections. Training courses on HCWM practices and injection safety should be included in all health care programs.

In addition to providing training on waste segregation and ensuring an adequate supply of injection safety equipment, it is essential that scaled-up programs consider final disposal of medical waste as a main component of the program. Final disposal is a key element to ensuring that infectious waste is appropriately eliminated and that no one at the community will be at risk of contamination.

Further analysis needed

Given the attention that it is being paid to increasing access to testing and treatment for HIV/AIDS, TB, and malaria, the needs for injection safety equipment and the amount of infectious waste produced will increase exponentially. Programs must begin to integrate injection safety into routine budgets and plans in order to ensure that treatment does not result in the inadvertent spread of disease.

More work is needed to quantify injection safety equipment needs and to support planning for safe HCWM. The analysis above is intended to start discussions in this area and to support advocacy efforts to integrate injection safety as an essential element of all health care programs including HIV/AIDS, TB, and malaria. Please send comments or any data you may have in this area to Nancy Muller (nmuller@path.org) at PATH.

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