# Needle Remover Technical Overview

## Background

Each year, more than 16 billion injections are administered worldwide.[1] In some regions, 17 percent to 75 percent are estimated to be with reused, unsterilized injection equipment.[2] Unsafe reuse of syringes is estimated to cause 20 million hepatitis B infections, 2 million hepatitis C infections, and 250,000 HIV infections annually.[3] The main tools to prevent reuse of unsterile syringes and needles are safety syringes such as autodisable and retractable devices. However, most syringes currently in use do not prevent reuse and therefore, safe, appropriate disposal of sharps and syringe waste plays a critical role in safe injection and reuse prevention.

**Figure 1. A busy immunization session in India**

World Health Organization (WHO) guidelines recommend disposal of used syringes and needles in cardboard safety boxes. These safety boxes must then be further treated for disposal, for example, by burial, incineration, or autoclaving and shredding. In developing countries, where reuse is most prevalent, policies and practices regarding safe disposal of sharps waste are inadequate.

Safe injection is impaired by the lack of policies about disposal of sharps, lack of appropriate equipment, and lack of evidence of cost-effective systems. Currently, in most areas of the developing world, sharps waste is dangerous to the community, and health care workers and waste handlers are not protected from hazardous sharps when collecting, storing, transporting, or disposing of sharps waste. [4,5,6]

Several needle removal technologies exist that are designed to disable syringes immediately after the injection. These include devices requiring battery or electric power and others that are manually operated. This document provides an overview of manually operated needle-remover devices.

### Rationale for Needle Removal

Manual needle removers (hereafter referred to as needle removers) are used by injection providers to separate the hub and needle from the syringe. Needle removers immediately isolate the contaminated sharp and disable the syringe. The process results in two waste streams: the contained needles (sharps) and the “defanged,” disabled syringes. Needle removers are used to reduce the risk of potential infection to patients, health care workers, waste handlers, and the community through safer waste-disposal systems.

### Advantages

The advantages of needle removers include:

- Immediate isolation of the contaminated sharp.
- Prevention of syringe reuse.
- Reduction of risk to waste handlers and the community from improper disposal of sharps.
- Reduction in the waste volume of infectious sharps. (Figure 2)
- Reduction in the number of safety boxes used (more defanged syringes fit in each disposal box).
- Allows for immediate, onsite disposal of sharps via protected pits or barrels.
- Increased potential for recycling and other innovative ways for managing syringe waste.
- Heightened awareness of contaminated sharps by creating behavioral practices specific to management of infectious sharps waste.

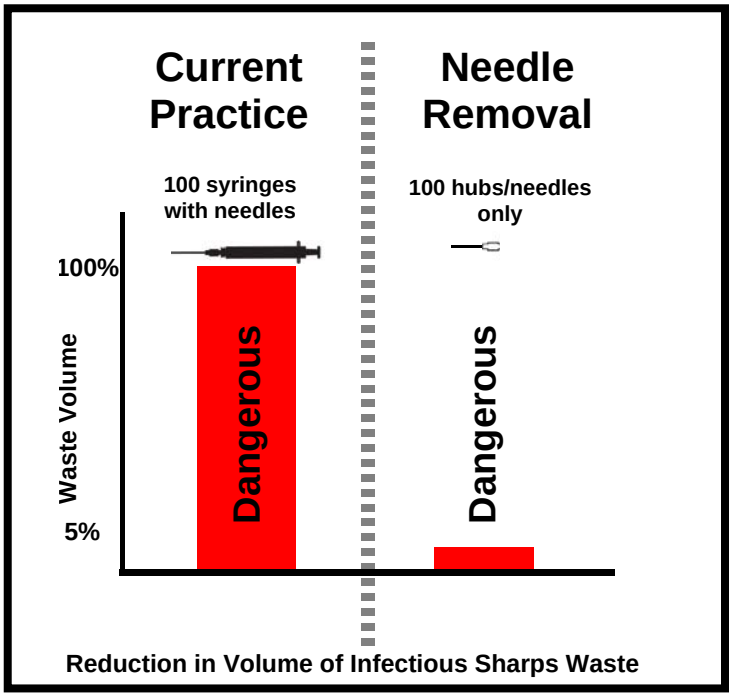


**Figure 2. Needle removal and reduction in infectious sharps waste volume**

### Disadvantages

The disadvantages of needle removers include:

- Cost: US$4–US$55 per device
- Need for protected sharps pit or barrel for disposal of needles.
- Needle removers should be located where injections are given; depending on the number of injection sites, this may require a number of devices in each facility.
- Extra step added to injection process.
- Training required to ensure proper use and device maintenance.

## Scenarios for Needle Remover Use

### Disposal of Needles

Contained needles are disposed of into a protected sharps pit or barrel. A sharps barrel is recommended for facilities located in areas where the water table is high or burial space is limited. Sharps disposal onsite eliminates the need for further handling and transport of the hazardous sharps.

### Disposal of Defanged Syringes

The "defanged" syringes can be collected in a safety box, or with other infectious waste in plastic bags, and disposed of according to existing practices. Defanged syringes may also be disinfected with sodium hypochlorite and processed for shredding and plastic recycling.

### Determining Optimal Use

Needle removal is optimal where there are significant risks of handling sharps, or where the costs of transporting sharps waste from the point of the injection to the place of final disposal are high. Examples of settings where needle removers are optimal include places where:

- Collection systems are used to facilitate centralized disposal or waste processing.
- There is a lack of safe onsite disposal for sharps.
- Immunization outreach takes place, requiring sharps waste to be carried by hand for long distances.

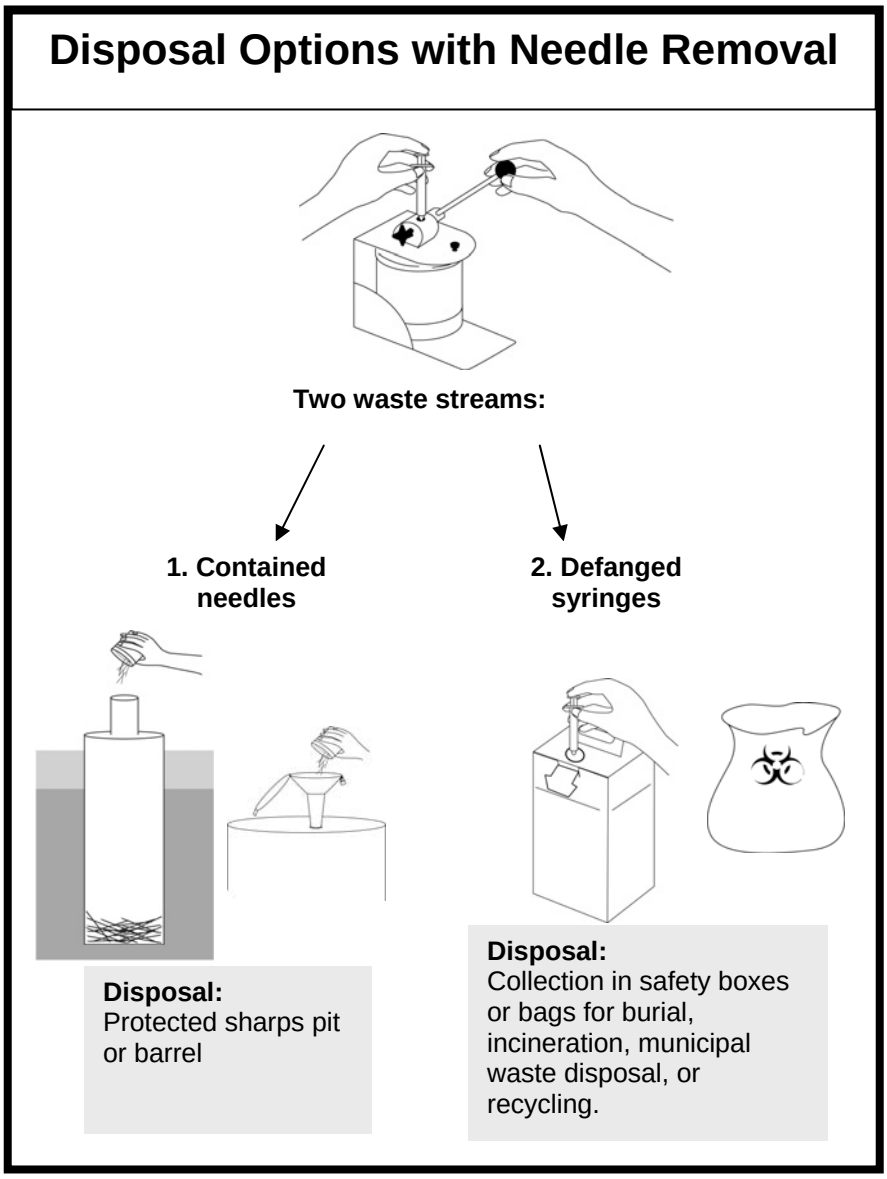


**Figure 3. Disposal Options with Needle Removal**

Only when all injections are given in close proximity to the place of safe, final disposal do the benefits diminish and the additional handling steps associated with needle removal seem onerous. PATH has published a resource, *Optimal Settings for Needle Removers*, that includes descriptions of health facilities and injection settings and details where use of needle removers is optimal and where it is not recommended.
http://www.path.org/files/TS_settings_for_needle_remover.pdf

### Training

Training is a critical component of successful introduction of needle removers, ensuring safe use of the device and proper maintenance.

PATH has recently published *Training Health Workers in the Management of Sharps Waste*, a set of training modules that are designed to be adapted for use in various health care settings. The purpose of these materials is for use in training health workers in the management of sharps waste. These materials are divided into two training guides, one for training injection providers and one for training waste handlers. The training for injection providers includes a module on use and maintenance of needle removers. The training for waste handlers includes modules on disposal of removed needles using sharps pits and barrels.

*Training Health Workers in the Management of Sharps Waste* is available for download from PATH's website. http://www.path.org/publications/pub-series.php?stk=Training%20Health%20Workers%20in%20the%20Management%20of%20Sharps%20Waste

### Needle Remover Resources

PATH has gathered available online resources on needle removal to provide easy access to information. This web page is intended to serve as a resource for countries and programs considering the introduction of needle removers. Included in these resources is essential information for planning and decision making. The Needle Remover Resource page can be found at http://www.path.org/projects/health_care_waste_needle_remover_resources.php.

## Field Evaluations

### PATH Evaluations

PATH has conducted evaluations of needle removers in India, Senegal, Uganda, and most recently in Vietnam. Reports on all of these evaluations have been or are being published. Different devices have been introduced in various settings including curative, family planning, and immunization outreach. In general, findings indicate high acceptability of needle removers among health workers. The health workers report the devices are easy to use and some report that they feel safer in their jobs as a result of using a needle remover. Some of these evaluations have attempted to collect data on needlestick injury. When questions were posed, evaluation teams reported difficulty in collecting data on needlestick injury due to the stigma attached to these injuries. More detailed findings can be found in the respective reports posted on PATH's Needle Remover Resource page http://www.path.org/projects/health_care_waste_needle_remover_resources.php.

### WHO Evaluations

WHO has supported evaluations of needle removers in Eritrea, Ukraine, Madagascar, and Myanmar. Reports have been published on the experiences in Eritrea and Ukraine. In January

2006, WHO published *Review of studies conducted on the use of needle removal devices*, in an effort to summarize the body of work related to evaluation of needle removal that has been conducted to date. This report called for more research to be conducted on the impact of use of needle removers on health workers' safety and waste volume. More detailed findings can be found in the respective reports which can be accessed through PATH's Needle Remover Resource page http://www.path.org/projects/health_care_waste_needle_remover_resources.php.

## Policy and Practice

Needle removers are being introduced in many countries. Below are some examples of how the technology is being mainstreamed:

- **WHO** reference materials include needle removal as one of several options for managing sharps waste. Specifications on needle removers are currently under development as part of WHO's Performance Quality and Safety System.
- **The GAVI Alliance** Research and Development Task Force listed needle removal as one of its three top priorities. GAVI partners urged that WHO's work on equipment specifications be given priority, and that guidelines for sharps disposal should be adapted as needed, based on emerging findings, to include needle removers.
- **The Government of India** recently issued a tender for 100,000 needle removers for a national roll-out after a successful introduction of 14,000 devices in the state of Andhra Pradesh.
- **Making Medical Injections Safer,** a project funded by the President's Emergency Plan for AIDS Relief, has facilitated the introduction of several thousand needle removers into health facilities in Africa and the Caribbean.

## Availability of Needle Removers

There are many needle removers available and in use throughout the world. Devices range in price and quality. Below is information on three devices that have been evaluated by PATH or WHO in health care settings. Inclusion in this list does not constitute an endorsement by PATH.

### Balcan Mini-Destructor

The mini-destructor is manufactured by Balcan Engineering, Ltd.,UK (Figure 4). It has an opening at the top into which a used needle is fully inserted. When the handle is pulled down, the circular blade makes two concurrent cuts—one through the syringe hub, completely separating the needle from the syringe, and one through the needle itself, rendering it nonreusable. The needle remnants fall into the plastic container below, which can either be completely disposed of, or emptied and reused. The container holds approximately 250–350 needles depending on the size of the needle and hub. The device is


**Figure 4. Balcan Mini-Destructor**

14 cm x 11 cm x 7 cm and with an empty container weighs 745 g. The current estimated cost is US$55 per device, depending on the volume ordered. Contact Balcan Engineering for quotations. http://www.balcan.co.uk/destructor/about.php

### BD™ Hub Cutter

The Hub Cutter, developed by BD, is a puncture resistant plastic, disposable needle removal device (Figure 5). It has an opening at the top into which a used needle is fully inserted. When the two sides of the Hub Cutter device are squeezed together, a blade in the opening cuts through the plastic hub, separating the needle from the syringe. The needle is collected in the plastic Hub Cutter device, which is disposed of when full. The Hub Cutter is not designed to cut the metal needle cannula–doing so will damage the blade. The Hub Cutter holds 400 to 600 needles. The device measures approximately 13x6x11 cm and weighs 113 g when empty. The entire device can be disposed of by burial or it can be disposed of in the same manner as a safety box. It is made of plastics that can be incinerated without causing harmful emissions. The current estimated cost is US$4 per device. Contact BD for exact quotations. http://www.bd.com/immunization/pdfs/products/bd_hub_cutter_brochure.pdf


**Figure 5. BD Hub Cutter**

### BMDi Nomoresharps®

The Nomoresharps device is manufactured by BMDi Pty Limited (Figure 6). This is a stainless steel needle remover with a removable plastic container. It has an opening at the top into which a used needle is fully inserted. The handle of the device is pushed downward to rotate the cutting mechanism, which shears the hub from the syringe and cuts the needle into pieces to render both needle and syringe useless. Once the orifice has been realigned by raising the handle, the hub and needle fall into the plastic needle container underneath, which is either emptied or completely disposed of when full. The needle container holds 250 to 300 needles. The device measures approximately 13 cm x 15 cm x 8 cm and weighs 850 g with an empty container. The current estimated cost is US$25 per device, depending on volume. Contact BMDi Pty Limited for exact quotations. http://www.bmdi.net/cutter_mini.htm

**Figure 6. BMDi Nomoresharps device**

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