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NEEDLE REMOVER ACCEPTABILITY ASSESSMENT REPORT

GUYANA SAFER INJECTION PROJECT

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This report contains the findings of interviews, observations and record reviews conducted by Initiatives Inc. to assess needle remover use and acceptability in Guyana. The report was prepared under the auspices of the Technical Assistance and Support Contract (TASC2 Global Health), implemented by Initiatives Inc. under Task Order No. GHS-I-02-03-00040-00 with the U.S. Agency for International Development.

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DISCLAIMER

The opinions expressed in this report are those of the individual authors and do not necessarily represent the views of the United States Agency for International Development or the United States Government.

ACRONYMS

BMDi.....Biomedical Devices International

GSIP.....Guyana Safer Injection Project

HIV .....Human Immunodeficiency Virus

HC.....Health Center

HOSP.....Hospital

HP.....Health Post

MEDEX.....Medical Extension Worker

MS.....Microsoft

NR .....Needle Remover

PATH.....Program for Appropriate Technology in Health

PEPFAR.....President's Emergency Fund for HIV/AIDS Relief

WHO.....World Health Organization

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EXECUTIVE SUMMARY

BACKGROUND

The Guyana Safer Injection Project (GSIP) is working to assist the Ministry of Health to find effective, safe and affordable options for final disposal of needles. To provide a mechanism for safe needle disposal, GSIP piloted a needle removal device and sharps barrel at health posts, health centers and small hospitals in regions six, ten and seven. As GSIP prepares to expand to other regions, a review of the efficacy of needle removal devices and sharps barrels is required. This assessment was designed to gather information on the use, acceptability and relative cost of needle removers and sharps barrels in order to provide the Ministry of Health with evidence to help it make informed plans and policies with regard to needle removal devices.

KEY FINDINGS

- 100% (35) of health workers and waste handlers interviewed felt that the needle removal device and sharps barrel reduced their risk of needle stick injury.
- 94% (17) of health providers and 100% (17) of waste handlers interviewed rated the performance of the needle removal device as either "very good" or "excellent."
- 100% (18) of health providers felt the devices were easy to use.
- 100% (17) of waste handlers felt the disposal process associated with needle removers and sharps barrels was easy.
- No needle stick injuries were reported at any of the pilot sites in the last 12 months.
- 94% (29) of needle removers were observed to be in good or excellent condition.
- Only 55% (10) of needle removers are being thoroughly cleaned as required.
- 50% (8) of sharps barrels contain objects other than needles.
- The additional per annum cost of using needle removers and sharps barrels for sharps disposal ranges from US $29.66 to US $15.38. See Table 7 for details.

RECOMMENDATIONS

- Maintenance is critical to the effectiveness and longevity of the needle removal devices. To ensure proper care, maintenance training should be integrated into training for health providers and waste handlers on needle remover use. While all workers should be capable of caring for the needle removal device, clear responsibility for maintenance should be assigned to a worker in each facility.
- Supervision should be provided on needle remover use and maintenance, especially during the months directly following the introduction of the needle removal device and sharps barrel. Thereafter, supervision of needle removal and waste management systems should be integrated into regular visits by health facility supervisors.
- Signage should be placed on sharps barrels indicating that only needle waste should be deposited in them.
- While hospital staff appreciate the needle removal devices, maintenance appears to present greater challenges in hospital settings than in health post or health center settings. In settings with multiple users, more attention should be provided to ensure that the needle removal device is being used and maintained appropriately and that needle waste is being disposed of safely.

- The use of needle removers has added costs that need to be carefully considered. However, the contribution of the needle removers and sharps barrels to the containment of sharps waste is significant. The combined use of needle remover and sharps barrel provides a more secure option for needle waste disposal than the safety box alone. The containment of waste may be well worth the added costs of using the needle remover and sharps barrel. Methods of reducing costs, as noted above under *Key Findings*, should be explored.

INTRODUCTION

BACKGROUND

The World Health Organization estimates that unsafe injection practices result in as many as twenty million hepatitis B infections, two million hepatitis C infections, and a quarter of a million HIV infections worldwide annually. Through the PEPFAR-funded Guyana Safer Injection Project (GSIP), the Guyanese Ministry of Health is working to reduce the number of unnecessary and unsafe injections that put its population at risk by:

- promoting rational injection use
- increasing the demand for oral medications
- improving adherence to standards for safer injection and waste management practices
- reducing community exposure to used needles and syringes

A key objective of the Guyana Safer Injection Project is to assist the Ministry of Health to find effective, safe and affordable options for final disposal of needles. To provide a mechanism for safe needle disposal, GSIP piloted a needle removal device at health posts, health centers and small hospitals in regions six, ten and seven. Although Guyana has had experience with needle removers in the past, the previous remover was deemed to present safety risks to health workers and was abandoned. The influence of injection safety projects related to HIV prevention programs has led to the design and manufacture of new, more effective, and safer devices for needle cutting. These devices have been tested and scaled up in a diverse range of African and Asian countries. The Balcan needle cutter introduced by GSIP is one of these new, internationally tested, devices, as is the BMDi Nomoresharps® needle remover described in Appendix 6.

The needle removal device introduced by GSIP is a stainless steel tool, about five square inches in size, with a rotating blade and a handle to control needle cutting. The device is simply engineered, can be dismantled and cleaned on site, and is estimated to last up to five years depending on use and maintenance. By completely severing the needle from the syringe, the needle remover makes isolating sharps waste much easier, disposing of syringes safer, and provides better protection for waste handlers from sharps injuries where incinerators or other effective waste disposal systems are not available.

To provide a safe option for needle disposal, sharps barrels were also introduced at sites with needle removers. Sharps barrels are made of locally available 45-gallon plastic drums into which aluminum funnels are inserted to ensure the safe disposal of needle waste. The funnels are made locally, based on patterns provided by GSIP. The barrels protect health workers and community members from sharps. They are estimated to take 40 years or more to fill – depending on the number of injections given at a site – after which they can be sealed and buried.

RATIONALE FOR PILOTING THE NEEDLE REMOVER IN GUYANA

The lack of effective options for safe sharps disposal in Guyana presents environmental and safety hazards for staff, patients and community members. While safety boxes continue to play an important role in sharps disposal in Guyana, disposal of the safety boxes, and the needles they contain, remains a problem at many sites. Some sites use burn boxes to destroy the safety boxes; however, the heat generated in burn boxes is not adequate to destroy the needles. Other sites dump safety boxes in rivers or trenches or place them in ordinary waste bins, which are then taken to community dumpsites. These disposal methods compromise the health and safety of health workers and community members by:

- increasing the risk that blood-borne diseases will be spread through needle stick injury
- polluting air, soil and surface water

- degrading the landscape

The environmental costs of unsafe waste disposal methods cannot be quantified in monetary terms. Therefore, until a new system or technology for the safe disposal of sharps waste is adopted in Guyana, effective, low-cost options for sharps waste disposal need to be considered. WHO continues to consider the appropriateness of needle removers, but has noted that in developing countries with limited resources for safe sharps disposal, the needle removal device is a viable option for the safe management of sharps waste (WHO, 2004[1]).

The environmental benefits derived from using the needle remover as part of a comprehensive strategy to manage sharps waste include:

- reducing the volume of contaminated needles that require disposal
- promoting public health by reducing the potential spread of blood-borne diseases to health care workers and community members due to unsafe disposal of sharps
- reducing the amount of used safety boxes that require disposal, thus reducing costs
- improving the aesthetics of the final disposal site through onsite containment of needles in barrels

To address these safety and environmental issues in a feasible, low-cost manner with an appropriate and sustainable technology, the GSIP project introduced the needle removal device at 34 pilot sites.[2] As GSIP prepares to expand to other regions, a review of the efficacy of needle removal devices and sharps barrels is required.

ASSESSMENT PURPOSE

The purpose of this assessment was to gather evidence on the use, acceptability and relative cost of needle removers so as to assist the Ministry of Health in making evidence-based decisions/policies about the integration and use of needle removers in the public health system.

ASSESSMENT OBJECTIVES

1. Document practices in and problems/issues related to needle remover use, maintenance and waste disposal.
2. Gather information on staff and waste handler perceptions of the needle remover, its safety, usability and effectiveness.
3. Gather information on waste disposal, with particular attention to the handling of needle sharps and the use of barrels.
4. Assess the relative costs of the needle remover as compared with safety boxes.

[1] Proposed agenda to evaluate the risks and benefits associated with using needle removal devices, May 2004.
[2] An additional five BMDi Nomoresharps® needle removers are being field tested in four sites in Guyana.

ASSESSMENT DESIGN

METHODOLOGY

The assessment was conducted in two phases. Phase One entailed the drafting and field testing of the assessment protocol and data collection instruments. Phase Two included data collection, data entry, data analysis and report writing.

SITE SELECTION

A purposive sample of 16 sites, two of which were compound sites including a hospital and clinic, was chosen; the sites are detailed in Table 1. The criteria used in selecting sites included the following:

- preference was given to sites not included in the January field test
- 50% of sites in each region = 6 in region 10 and 10 in region 6
- only accessible sites selected
- representation of urban and rural sites
- representation of health centers, health posts and hospitals
- selection of some sites that have had the needle removers for a year or more along with sites that have had the needle removers for a shorter period of time

Table 1: Site Selection

Region	Site CODE	Type*	# NRs*	Date Placed	Accessible?^	Location	Days of Operation
10	1	HP	1	8/6/06	yes	Rural	Tuesday
10	2	HP	1	8/6/06	yes	Rural	Last Wed. in the month
10	3	HC	2	8/6/06	yes	Urban	Mondays
10	4	HP	1	8/6/06	yes	Rural	Tuesdays
10	5	HC	2	8/6/06	yes	Urban	Wednesdays
10	6	HC	2	8/6/06	yes	Urban	Mondays
6	7	HC	2	24/7/06	yes	Rural	Tuesdays
6	8	HC	2	24/7/06	yes	Rural	Mondays
6	9	HP	1	24/7/06	yes	Rural	Wednesdays
6	10	HC	2	4/4/05	yes	Peri-urban	Tuesdays
6	11	HOSP+HC	3	15/11/06	yes	Rural	Mondays
6	12	HP	2	11/6/06	yes	Rural	Mondays
6	13	HC	2	11/6/06	yes	Rural	Tuesday & 4th Friday
6	14	HC	2	15/11/06	yes	Rural	Tuesdays
6	15	HOSP+HC	8	4/4/05	yes	Urban	Mondays
6	16	HC	2	18/4/05	yes	Rural	Tuesdays

*HP = health post; HC = health center; HOSP = hospital; NR = needle remover.

^Accessible refers to whether the facility can be accessed with a standard vehicle in a few hours or less.

TOOLS

Five data collection instruments were developed for the assessment. Table 2 lists these instruments and the number that were completed during the assessment.

Table 2: Data Collection Instruments

Instrument	Number of Completed Forms
Health Provider Interview	18
Waste Handler Interview	17
Maintenance Interview	18
Observations	18
Record Reviews	18

DATA COLLECTION AND ANALYSIS

Data collection was completed by a team of two persons: a GSIP staff member and a project consultant. It was conducted over a period of three weeks and organized so that site visits fell on days when clinics were open and operating. Data were recorded directly on the data collection forms.

When data collection was complete, the forms were scanned and sent electronically to the consultant responsible for data entry and analysis. Data were entered into a MS Access database and analyzed using MS Excel.

RESULTS

ACCEPTABILITY

Overall, health providers and waste handlers were highly satisfied with the needle removal devices and the sharps barrels. Ninety-four percent (17) of health providers rated the performance of the needle removal device as either "very good" or "excellent." One hundred percent (17) of waste handlers rated the needle disposal system for the needle removal devices as "very good" or "excellent."

Although the needle removal device requires additional steps, health workers felt the additional time necessary to use the device was not significant. Ninety-four percent (17) of health workers felt the needle removal device only moderately increased the time it took to provide an injection or did not increase the time it took.

Ease of Use

All eighteen (100%) health providers interviewed said they found the needle removal devices easy to use. All seventeen (100%) waste handlers interviewed also found the disposal process, including removing the needle containers from the devices and emptying them in the sharps barrels, to be easy.

Perceptions of Safety

Perhaps more importantly, 100% of health providers and waste handlers interviewed felt that the needle removal device and the sharps barrel reduced their risk of needle stick injuries and therefore increased their safety. Of the 18 health providers interviewed, 89 percent (16) preferred the needle removal device to safety boxes. Those who preferred the safety boxes felt that they took less time. Providers who preferred the needle removal devices said they felt safer using them. They expressed concern that needles could slip from or poke through safety boxes and injure them and that safety boxes sometimes became wet or compromised in some other way, thereby increasing their risk of needle stick injury.

Table 3: Acceptability

Issue	Health Provider (n=18)	Waste Handler (n=17)
Feels needle removal device reduces risk of needle stick injury	100%	100%
Feels safer using needle removal device than using the safety box	100%	100%
Prefers using needle removal device to safety box	89%	

Safety

No waste handlers or health providers interviewed reported having received a needle stick or other injury related to the needle removal device. Reviews of needle stick register books also indicated that no needle sticks injuries occurred at any of the sites over the last 12 months.

APPROPRIATENESS OF USE

In observations of health providers using the needle removal devices, providers demonstrated correct usage of the device 91 percent of the time on average (Table 4, next page).

Eighty-three percent (15) of health providers interviewed stated that they cut their needles at the correct location – the level of the shaft. The three providers who reported ever cutting the needle in the wrong location (usually below the shaft) all stated that this was done early on and that supervisors identified the problem during follow-up supervision provided by GSIP and corrected the problem shortly after training. Their statements underscore the importance of supervision for ensuring correct usage of the needle removal device.

Table 4: Appropriateness of Use

Issue	Health Provider Percentage	N=
Provider cuts the needle immediately following the injection	89%	18
Provider ensures that insertion hole is fully open before inserting the needle	94%	18
Provider inserts the needle fully into the hole before cutting	86%	14*
Provider maintains one hand on the syringe and the other on the arm/handle of the device while cutting	94%	18
Provider places the syringe in the safety box immediately after cutting the needle	94%	18
Provider adjusts the handle so the insertion hole is fully open again	89%	18
Average	**91%**	

*Data was omitted in four of the instruments. The exact reason for this omission is unknown but likely had to do with the formatting of the data collection tool.

FUNCTION AND DURABILITY

Only one waste handler interviewed (6%) reported that a needle removal device had malfunctioned. In this case (a hospital site) the handle of the device had become disengaged. None of the health providers interviewed reported ever having problems with the needle removal device.

A needle remover in excellent condition should have no rust, be clean, should move smoothly and should cut through a needle in one motion without requiring a lot of pressure. Observations of the 31 needle removal devices in use at sample sites found 29 percent (9) in excellent condition, 65 percent (20) in good condition, and six percent (2) in fair condition. The condition of needle removers was worst at hospital sites. Of the eight needle removers found in hospitals only two were in excellent condition, four were in good condition and two were only in fair condition. Sites with high volume of patients and larger numbers of staff may require additional supervision to ensure that needle removers are adequately maintained.

Eighty-seven percent of the devices tested (27) were easily able to cut through a needle in one motion. The most common problem identified with the needle removers was rust, found on 61 percent (19) of the needle removers. Lack of maintenance clearly contributed to some rust problems as 88 percent (7) of needle removal devices which had never received a thorough cleaning had rust, accounting for 37 percent of needle removers with rust. However, rust was not severe on any of the needle removal devices. Seventeen of the needle removal devices had very little rust and operated normally. Two of the needle removal devices showed rust on key locations, such as the blade or arm, but both of these devices also operated normally. Sixty-eight percent (21) of the needle removers observed had small nicks or chips on the device blade; however, these nicks are considered normal wear and tear and did not interfere with the operation of the device.

MAINTENANCE

Proper maintenance is critical to the functioning and durability of needle removal devices. If not regularly cleaned and oiled, the needle removal devices can rust and become stiff or inoperable. Needle removers should receive a basic cleaning, consisting of a dusting and wipe-down, at least once a week. At least once a month needle removers require a thorough cleaning, which includes taking the device apart, cleaning it with warm soapy water, removing any rust or

dirt with steel wool, drying the device thoroughly, applying lubricant, and reassembling the device.

Ninety-four percent (17) of staff responsible for maintenance of the device reported doing a basic cleaning of the needle removal device at least once per week (Table 5). However, only 55 percent (8) reported ever doing a thorough cleaning of the needle removal devices and only 70 percent (12) had lubricated the device.

Table 5: Maintenance

Issue	Percentage	N=18
Basic cleaning done at least once per week	94%	17
Thorough cleaning done at least monthly	55%	10
Device lubricated at least monthly	67%	12

Importantly, 50 percent of the workers responsible for maintaining needle removers noted that other workers also participate in the maintenance of the device. In most cases these other workers included clinical staff such as nurses and MEDEX workers. This suggests that maintenance training should also be provided to nurses and MEDEX workers when they receive training to use the device and not just to waste handlers or other clinic support staff.

DISPOSAL SYSTEM EFFECTIVENESS

Only 50 percent of sites disposed needles exclusively into the sharps barrel. Health providers noted that some staff continued to use the safety boxes either because the staff member was new to the facility or because they had forgotten and, out of habit, threw the needle and syringe into the safety box together. Observations of safety boxes suggest that the majority of needles at pilot sites were being cut with the needle remover; however, additional emphasis during training on the importance of using the needle remover for all needles may help address the issue.

No waste handlers reported liquid or needles escaping from the device during disposal. Sharps barrels also were observed to be in excellent condition and had no reported problems or malfunctions. In one case, however, the key to the funnel lock on the sharps barrel was lost and the waste handler had to remove the funnel to continue using the sharps barrel. Facilities may need assistance in developing effective systems for ensuring that keys to sharps barrel funnels are not lost.

Table 6: Disposal Systems

Issue	Percentage	N=
Liquid escaping from the device	0%	0 of 17
Needles escaping from the device	0%	0 of 17
Ever had problems disposing of needles in the sharps barrel	0%	0 of 17
Barrel problems or malfunctions in the last 12 months	0%	0 of 17
Barrel contains objects other than needles	50%	9 of 18

Sharps barrels are supposed to contain sharps waste only. Fifty percent of the sharps barrels observed contained objects other than needles. These objects included vials, gauze, syringes and, in one case, liquid of some sort. In most cases, only a few of these objects were observed inside the barrel, suggesting that the barrel was not commonly used for their disposal. Signage on the barrel indicating that only sharps are to be disposed of may help address this problem.

In a few cases funnels were found to be blocked by gauze and in one case a cluster of needles was jammed in the funnel. The issue of needle clusters was of greatest concern. Made locally, some funnels appeared to have small lips of flange remaining which slightly reduced the diameter of the funnel shaft. This problem was easily repaired by sanding the lip down and manufacturers have made sure that new funnels do not have this problem.

COST

The needle remover and sharps barrel provide economical options for improving worker safety; however, they are not without costs. The Balcan needle removal device examined in this assessment costs US $64/device. The per device freight cost is estimated at about US $11, bringing the total per device cost to approximately US $75/device. To be effective, needle removal devices are required at every injection station in a facility.

Table 7: Costs

Site Number	Facility Type	Injections/ Year§	NRs	Sharps Barrel	Total Estimated Annual Cost	Total Estimated Annual Cost per Site
1	Health Post	436	2	1		
2	Health Post	1,545	1	1		
3	Health Center	1,032	1	1		
4	Health Post	160	1	1		
5	Health Center	972	1	1		
6	Health Center	856	2	1		
7	Health Center	2,728	2	1		
8	Health Center	336	1	1		
9	Health Post	200	1	1		
10	Health Center	812	2	1		
11	Hospital	816	1	1		
	Health Center	712	2			
12	Health Center	260	2	1		
13	Health Center	260	2	1		
14	Health Center	492	2	1		
15	Health Center	2072	1	1		
	Hospital	137	7			
16	Health Center	916	2	1		
Total		**14,742**	**33**	**16**		
Balcan	**$75/5 years**		**$495**	**$39.20◊**	**$534**	**$29.66^**
BMDi+	**$36/5 years**		**$238**	**$39.20**	**$277**	**$15.38**

§Estimated based on number of injections in the last three months registered in facility record books.

◊Each sharps barrel costs GD 5,000 and the funnels cost GD 14,600/funnel for a total of GD 19,600 (USD 98.00/barrel). The barrels are estimated to take forty years to fill. Based on this, a cost of US $2.45/year/barrel was calculated.

^This calculation does not include the cost of lubricant, which sites would also need to properly maintain needle removers. Most pilot sites used petroleum jelly, machine oil, or coconut oil to lubricate their devices.

+Nomoresharps®

Table 7 shows that some sites have as many as seven needle removers while others have only one; these numbers correspond to the number of injection stations at the respective facilities.

Each device is estimated to last between two and five years, depending on use and maintenance. Since the volume of use was relatively low at the sites included in these studies, a lifespan of five years was used to estimate costs in Table 7. The sharps barrel is estimated to last up to 40 years.

Currently, syringes are deposited in safety boxes after the needle is removed. If this practice is maintained, the cost of supplying safety boxes has to be considered; however, it does not appear necessary that this practice continue. Without the needle, syringes could be placed in red-lined, infectious waste, bins, greatly reducing the need for safety boxes.[3] Table 7 shows that needle removal devices will cost an average of US $29.66/site/year for the sites included in this assessment.

Costs may be reduced by procuring different needle removal devices. For example, the BMDi Nomoresharps® needle removal device (hereafter referred to as the Nomoresharps® needle remover) is currently being tested by the GSIP project in four facilities (Appendix 6 provides results of an assessment of Nomoresharps® needle remover performance and acceptability after three months of use). The Nomoresharps® needle removal devices cost US $25.00 per device with a an added freight cost of US $11 per device for a total of US $36 per device. Using the Nomoresharps® devices would reduce the per facility costs to US $15.38 annually.

[3] Bags have been used for defanged syringe disposal in Andra Pradesh, India (see Case Study: Andra Pradesh, Introducing and Scaling-up a Sharps Waste Management Program. PATH. November 2006. http://www.path.org/files/CP_ap_case_study_shps_wst.pdf). However, use of infectious waste bags has not yet been piloted in Guyana and would require limited application and review before scale-up.

RECOMMENDATIONS

- Maintenance is critical to the effectiveness and longevity of the needle removal devices. To ensure proper maintenance, maintenance training should be integrated into training for health providers and waste handlers. While all workers should be capable of maintaining the needle removal device, clear responsibility for maintenance should be assigned to a worker in each facility.
- Supervision should be provided on needle remover use and maintenance, especially during the months directly following the introduction of the needle removal device and sharps barrel. Thereafter, supervision of needle removal and waste management systems should be integrated into regular visits by health facility supervisors.
- Signage should be placed on sharps barrels indicating that only needle waste should be deposited in them.
- While hospital staff appreciate the needle removal devices, maintenance appears to present greater challenges in hospital settings than in health post or health center settings. In settings with multiple users, more attention should be provided to ensure that the needle removal device is being used and maintained appropriately and that needle waste is being disposed of safely.
- The use of needle removers has added costs that need to be carefully considered. However, the contribution of the needle removers and sharps barrels to the containment of sharps waste is significant. The combined use of needle remover and sharps barrel provides a more secure option for needle waste disposal than the safety box alone. The containment of waste may be well worth the added costs of using the needle remover and sharps barrel. Methods of reducing costs, as noted above under *Cost* (page 13), should be explored.
- Eliminating safety boxes where needle removers are used could help reduce costs. In the future, the Ministry of Health may want to consider the possibility of placing defanged syringes into infectious waste bins, rather than safety boxes. While safety boxes are currently subsidized by international agencies, the use of red infectious waste bags provides a viable option for the disposal of defanged syringes should support for safety boxes decline.

APPENDICES

1. **PATH GUIDANCE FOR NEEDLE REMOVER PLACEMENT AND MANAGEMENT**
2. **SHARPS BARREL GUIDANCE**
3. **NEEDLE REMOVER GUIDANCE**
4. **NEEDLE REMOVER MAINTENANCE**
5. **NEEDLE REMOVER TROUBLESHOOTING GUIDE**
6. **BMDi NOMORESHARPS® NEEDLE REMOVER PERFORMANCE AND ACCEPTABILITY ASSESSMENT**

ANNEX 1

PATH GUIDANCE FOR NEEDLE REMOVER PLACEMENT AND MANAGEMENT

DEVELOPING AN INTRODUCTION STRATEGY FOR NEEDLE REMOVERS

Use of a needle remover is one approach for managing sharps waste on site. To introduce and use needle removers in a safe and sustainable manner, it is critical for programs to develop a strategy for introduction of these devices. Although strategies for needle removers will vary for each program or country, the core components are detailed below:

1. Stakeholder Buy-In

Involve all medical waste stakeholders (from policymakers to health workers and waste handlers) in determining the feasibility and appropriateness of using needle removers. Compare trade-offs with other on-site medical waste strategies.

- Discuss the potential benefits of needle removers:
  - Prevents reuse of syringes.
  - Immediately contains sharps and reduces possibility of harm to waste handler and community since needles are disposed of on site, in a protected sharps pit or barrel.
  - Reduces the number of safety boxes needed.
- Discuss the requirements for successful use of needle removers:
  - Health workers, waste handlers, and supervisors require training.
  - Needle removers require maintenance.
  - A needle pit or barrel is required for final disposal.

2. Optimal Settings

Determine the settings where needle removers will provide the most advantages.

- Typically, needle removers are best used in remote sites where syringe destruction is not immediate.
- Needle removal will improve safety in situations where syringes will be extensively handed, such as during transport to a final destruction site.
- Needle removal is advantageous in situations where disabling or defanging is required, such as where syringes will be shredded, disinfected and recycled as waste plastic or then sent to a land fill.
- Hospitals are not an ideal setting for needle removers. However, if no on-site disposal system is available, some hospitals may benefit from needle removers. If used in hospitals, a plan must be in place to ensure that used syringes will not be batched for later needle removal.

Characteristics of optimal situations for needle removers are detailed in the following chart:

Site Characteristics	Where Needle-Remover Use is Optimal	Where Needle-Remover Use Is Not Recommended
Point of Injection	• Static injection points. • Where a needle remover is always available at each injection site.	• Where injection providers collect batches of used syringes prior to needle removal or disposal.
Disposal Options	• No incinerator on site or where incineration is not allowed. • Where community or animals have access to medical waste disposal site (no secure area). • Where syringes need to be defanged for transport, recycling, or autoclaving.	• Incinerator on site. • No needle pit or barrel available.
Supplies	• Inconsistent supply of safety boxes.	• Not enough needle removers to have one at each injection site.
Unsafe Practices	• Poor or no medical waste segregation practiced. • Poor compliance with use of safety boxes. • Reuse of syringes before final disposal.	• Incorrect use of needle removers observed after repeated supervision visits.

3. Needle Disposal Solution

Determine what type of needle disposal solutions (needle pit or barrels) will be implemented and identify funds to support construction/installment.

- A needle pit or needle barrel must be installed on site for final disposal of needles before needle removers are introduced.

4. Detailed Introduction Plan

Develop a detailed plan for where needle removers will be used and who will be responsible for each component of the system: training, supervision, use, cleaning, maintenance, and disposal.

- It is critical that all staff involved with needle removers are trained on proper use and routine maintenance.
- In facilities where there is a high turnover rate for staff, a strong training and supervision system must be in place. If there is no such system, needle removers may not be appropriate in the facility.
- If needle removers will be used in large facilities such as hospitals, draft detailed plans for each facility (including which wards will use the devices and defined roles and responsibilities).

APPENDIX 2

SHARPS BARREL GUIDANCE

Using a Protected Sharps Barrel

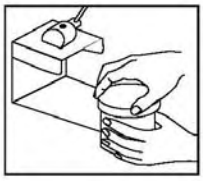
PATH

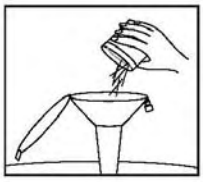
General use for disposal of needles

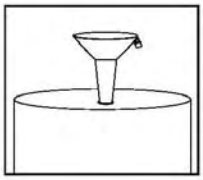
1. Remove the filled needle container from needle remover and immediately secure lid.
2. Keep the lid on the container when transporting the filled container to the sharps barrel.
3. Unlock and lift funnel lid.
4. Empty needle container into funnel with care to avoid spilling.

   Do not use the barrel for any other type of waste.
5. Keep funnel lid closed and locked when not in use.
6. Occasionally the barrel may be rocked gently to settle the contents evenly inside.

   Needles will tend to stack directly underneath the funnel opening; rocking helps to ensure that the entire barrel volume will be used.
7. Wearing plastic gloves, clean the container with bleach and hot water before reuse.







Cleaning needle spills

1. Put on protective gloves.
2. Pour bleach solution over needles and allow to sit for 15 minutes.
3. Using a dustpan and broom, carefully brush the needles off the ground and empty them into the sharps barrel through the funnel. Do not allow fingers or hands to come in contact with needles. Take special care to ensure that no needle fragments remain embedded in the broom.
4. After the needles have been removed, mop the area with a bleach solution.

Final disposal of barrel

The barrel is expected to hold approximately 150,000 needles before it is full. The fill level of the barrel can be examined by looking directly down into the barrel through the funnel. When it is full, the following steps should be followed:

1. Remove funnel. The funnel can be saved and used again for another barrel.
2. Fill the barrel with cement to safely encapsulate the loose needles.
3. Cap the hole and transfer the cemented barrel to landfill disposal.

APPENDIX 3

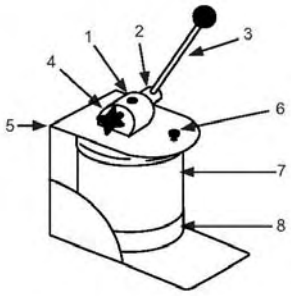
NEEDLE REMOVER GUIDANCE

Using a Needle Remover

PATH

Guidelines for safe use

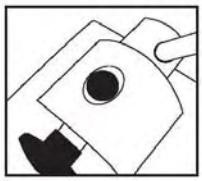
- Place a needle remover at each injection station and within arm's reach of the injection provider.
- Use device immediately after injection is given.
- Do not recap syringes.
- Do not save syringes for later removal of needles.



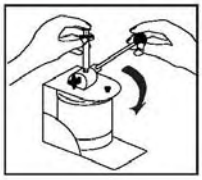
1. Insertion hole
2. Cutting drum
3. Handle
4. Cutting drum retention knob
5. Mount
6. Container retention screw
7. Needle container
8. Container lid

Instructions for use

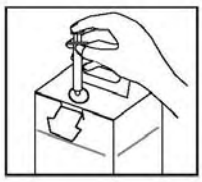
1 Move handle so that the insertion hole is fully open.



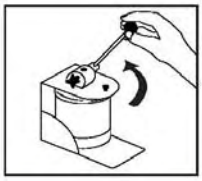
2 Insert needle completely into hole and use other hand to push the handle down until cutting is complete.



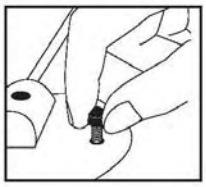
3 Place syringe into safety box or infectious waste bag.



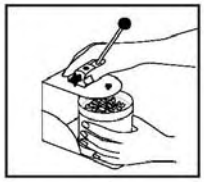
4 Move handle up to realign insertion hole; detached needle will fall into the needle container.



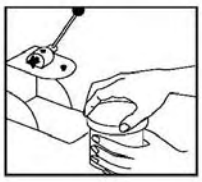
5 When container is full, unscrew container retention screw to full up position.



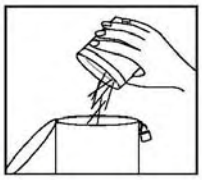
6 Squeeze the sides of the container and gently slide out of device mount, taking care not to spill contents.



7 Immediately place lid on top of container and screw on securely.



8 Empty the container into protected sharps pit.



page 1 of 2

Cleaning device

1. Remove container from device mount and secure with lid.
2. Holding the handle steady, unscrew the cutting drum retention knob. Pull out the drum, taking care not to misplace the spring washer.
3. Clean device with hot water and mild detergent. Do not use bleach.
4. Ensure device is dry and place small amount of oil or Vaseline on the cutting drum.
5. Insert cutting drum into device, place spring washer back on screw, and screw retention knob firmly into position.

Unscrew and remove cutting drum retention knob.

Cleaning container

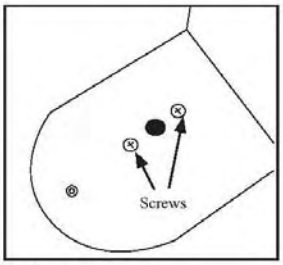
If needles are being emptied into a needle disposal pit, container may be reused after it is cleaned.

1. Clean empty container in a bleach solution.
2. Wash with mild detergent and rinse with hot water.

Rotating blade

The needle remover is expected to last for more than 100,000 uses. If the blade seems to be getting dull after many uses, it can be rotated for another 100,000 uses.

1. Remove container from device and secure with lid.
2. Remove the two screws from the bottom of the device mount that hold the cutting assembly in place. (For easier access to the bottom screws, the mount may be removed from the stand by loosening the two screws at the back of the device.)
3. Rotate the cutting assembly 180°, reattach, and tighten screws.



Bottom of mount.

Troubleshooting guide

- **Loose Handle:** If the handle becomes loose, use a wrench or screw driver to tighten it.
- **Stiff Handle:** With the handle rotated away from you, apply a small amount of oil or Vaseline on the closed insertion hole. Immediately rotate the handle towards you until it opens and completely closes again. Repeat application of oil or Vaseline. Rotate the handle back and forth several times to spread the oil or Vaseline.

APPENDIX 4

NEEDLE REMOVER MAINTENANCE

Maintaining a Needle Remover

PATH

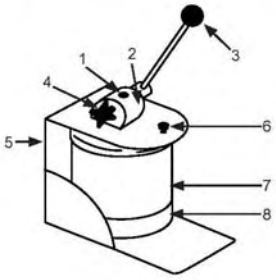
Regular cleaning and maintenance keeps the device working well.

Clean the surface of the device daily.

1. Wipe the surface of the device with a swab or cloth. **Do not use bleach.**
2. Dry the device with a dry cloth.

Lubricate the device weekly or as needed.

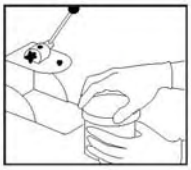
1. Apply a small amount of machine oil or other lubricant* on the closed insertion hole.
2. Immediately rotate the handle towards you to the stop position.
3. Repeat application of lubricant.
4. Rotate the handle back and forth several times to spread lubricant.



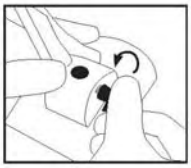
1. Insertion hole
2. Cutting drum
3. Handle
4. Cutting drum retention knob
5. Mount
6. Container retention screw
7. Needle container
8. Container lid

Monthly maintenance (clean the cutting drum and lubricate the device)

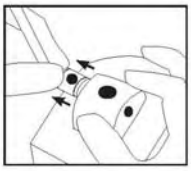
1 Wearing gloves, remove the needle container from the device, screw on the lid, and set the container aside.



2 Holding the handle steady, unscrew and remove the cutting drum retention knob and the spring washer.

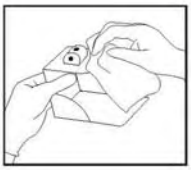


3 Pull out the drum.

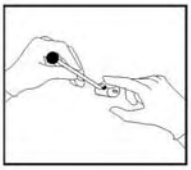


4 Clean the device mount and the cutting drum first with cold water and then with hot water and mild detergent. **Do not use bleach.**

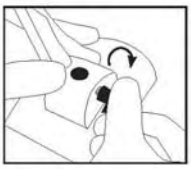
5 Dry the device with a disposable cloth.



6 Place a small amount of lubricant* on the cutting drum and spread it over the entire surface of the drum.



7 Insert the cutting drum into the device, place the spring washer back on the screw, and screw the retention knob firmly into position.



8 Rotate the handle back and forth several times to spread the lubricant inside the drum barrel.

*Lubricant alternatives: machine oil, Vaseline, cooking oil, grease, condom lubricant.

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APPENDIX 5

NEEDLE REMOVER TROUBLESHOOTING GUIDE

Troubleshooting Guide

Loose handle

If the handle becomes loose, use a wrench or screwdriver to tighten it at the base.

Stiff handle

If the handle becomes stiff, lubricate the device following the steps on page 1. If this does not relieve the problem, follow the steps on page 1 to disassemble and clean the device.

Residue buildup

If residue builds up on the drum and prevents easy rotation, the device should be disassembled, cleaned, and lubricated as shown on page 1 under "Monthly Maintenance."

Device handle locked in place

If the device stops working entirely, it is usually because there is a buildup of residue or a stuck needle that prevents the drum from turning.

1. Examine the drum hole to see if a needle is stuck and preventing rotation. If so, use a syringe or metal tool (e.g., tweezers, screwdriver) to push the needle into the container or remove the needle. **Do not use your fingers.** The drum may need to be rotated slightly while doing this in order to relieve any drum pressure on the needle.
2. If there is no needle stuck in the device, it is likely that there is a severe build up of residue that prevents the drum from turning. Follow instructions under "Monthly Maintenance" on page 1 to remove, clean, and lubricate the drum.

page 2 of 2

APPENDIX 6

BMDi NOMORESHARPS® NEEDLE REMOVER PERFORMANCE AND ACCEPTABILITY ASSESSMENT

The needle remover acceptability assessment conducted in March and April 2007 showed good performance of needle removal devices and appreciation of the devises by injection providers and waste handlers. The report concluded that needle removal devices are a viable option for improving safe sharps disposal and reducing the risk of needle stick injuries. The data collected in this report were based on the use of the Balcan needle removal device. Balcan needle removers cost approximately US $64 per device plus US $11 freight, for a total of US $75, which is costly in Guyana's resource-limited setting. In order to assess less costly options, five Nomoresharps® needle removal devices – costing US $25 per device and US $11 freight, totaling US $36 – were installed at four sites between April and May 2007. The performance and acceptability of the Nomoresharps® devices was assessed in August 2007 when they had been in use for approximately three months. A summary of findings follows.

SUMMARY OF FINDINGS

Acceptability

Ease of Use: As with the Balcan needle removal device, all providers (4) interviewed found the Nomoresharps® needle removal device and sharps barrel disposal system easy to use.

Perceptions of Safety: In addition, all providers and waste handlers felt the Nomoresharps® needle removal device reduced their risk of needle stick injury and all preferred the needle removal device to using the safety box alone.

Safety: No providers or waste handlers reported needle stick injuries related to the use of the needle removal device.

Appropriateness of Use

All providers reported cutting needles at the correct location, the nib. Observations of providers using the needle removal device indicated full compliance with guidelines.

Appropriateness of Use

Issue	Health Provider Percentage	N=
Provider cuts the needle immediately following the injection	100%	4
Provider ensures that insertion hole is fully open before inserting the needle	100%	4
Provider inserts the needle fully into the hole before cutting	100%	4
Provider maintains one hand on the syringe and the other on the arm/handle of the device while cutting	100%	4

Issue	Health Provider Percentage	N=
Provider places the syringe in the safety box immediately after cutting the needle	100%	4
Provider adjusts the handle so the insertion hole is fully open again	100%	4

Function and Durability

No malfunctions were reported with the Nomoresharps® needle removal devices, nor were any cases of rust or blade chips reported. After as much as three months of use, all five needle removal devices were observed to be in excellent condition.

Maintenance

A likely contributing factor to the excellent condition of the Nomoresharps® needle removal devices is improved maintenance. All four maintenance interviews indicated that the needle removers were being routinely wiped off and that thorough cleanings in which the devices are dismantled, cleaned with warm soapy water, dried, oiled and reassembled is occurring weekly. Revisions in the training curriculum for needle removal maintenance appear to have paid off as providers and waste handlers demonstrate better knowledge of needle remover maintenance and the condition of the needle removers suggests that they are following the maintenance guidelines.

Cost

Use the per device costs, combined with the cost of sharps barrels and safety boxes, a per site cost was estimated for each type of needle remover (*Cost* [main report], page 13). According to this calculation, use of the Nomoresharps® needle removal device will reduce the estimated annual per site cost for needle remover and safety barrel use from US $29.66 to US $15.38, a 48% savings.

CONCLUSIONS

While this assessment was carried out after the Nomoresharps® needle removers had been in use for only three months, more extensive use of the devices in Andra Pradesh, India and Vietnam (see http://search.atomz.com/search/?sp-a=00040367-sp00000001&sp-q=Nomoresharps or www.path.org) suggest the device has been effective in other contexts. Based on these findings, the use of the Nomoresharps® needle removal device is a viable option for reducing costs without compromising performance, safety or provider acceptability. Because of its value, the Nomoresharps® needle removal device may provide a more sustainable option for ensuring injection safety and safe sharps disposal at health facilities.