

# Evaluation of a Needle Remover Demonstration Project

A study from  
Huong Khe District,  
Ha Tinh Province, Vietnam

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PATH

2nd Floor, Hanoi Tower

49 Hai Ba Trung Street

Hanoi, Vietnam

Tel: (84-4) 9362215 Fax: (84-4) 9362216

[www.path.org](http://www.path.org)



## Table of Contents

<b>Acknowledgements</b> .....	<b>iii</b>
<b>Summary</b> .....	<b>iv</b>
Background.....	iv
Methodology .....	iv
Results .....	iv
Discussion.....	v
<b>1. Background</b> .....	<b>1</b>
Injection safety and health care waste management in Vietnam .....	1
<b>2. Methodology</b> .....	<b>2</b>
2.1. Objectives .....	2
2.2. Research design .....	2
2.3 Research sites .....	2
2.4 Supplies .....	2
2.5 Description of study interventions .....	3
2.6 Participants of the study.....	4
2.7 Data collection .....	5
2.8 Ethical considerations .....	5
<b>3. Results</b> .....	<b>5</b>
3.1. Use of needle removers.....	5
3.2 Acceptability of needle removers .....	6
3.3 Effect of needle removers on medical waste disposal practices.....	8
3.4 Needlestick injuries .....	9
<b>4. Discussion</b> .....	<b>10</b>
4.1 Improvements in medical waste disposal .....	10
4.2 Needlestick injuries .....	10
4.3 Recommendations .....	10
4.4 Summary.....	11
<b>References</b> .....	<b>11</b>

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We welcome comments on this needle-remover demonstration project with hopes to develop an effective and appropriate model for medical waste disposal at the commune level in Vietnam.

PATH and the Vietnam National Immunization Program

## Summary

### Background

PATH and the Vietnam Ministry of Health implemented a six-month demonstration project in Huong Khe District, Ha Tinh Province, Vietnam, to assess the acceptability, performance, and impact on waste disposal of a manual needle remover introduced at commune health centers (CHCs). The results of this demonstration project will enable the Vietnam National Immunization Program (NIP) to explore alternative methods for managing medical waste at the commune level that may be more effective and appropriate than current practices.

### Methodology

A total of 92 CHC heads and injection providers from 23 communes of Huong Khe District participated in the demonstration project. These CHCs were divided into three research groups, each using different methods for management and disposal of used syringes/needles from immunization and curative injections: Group 1 used needle removers, Group 2 used safety boxes, and Group 3 applied existing practices. CHCs in Group 1 were given adequate supplies of Nomoresharp® needle removers (Nomoresharp is a registered trademark of BMDi). Groups 1 and 2 received additional supplies of safety boxes and training on safe injection practices and use of needle removers and/or safety boxes before the start of the demonstration project. Group 3 (which applied existing practices) received injection safety training at the end of the project. All groups received monitoring visits. Before the study was initiated, the NIP reviewed and approved this study's protocol for ethical considerations.

The participating CHCs were evaluated before, during, and after the demonstration project on the use of needle removers and/or safety boxes, safe injection practices, sharps-disposal practices, and needlestick injuries. Data were collected through daily logs completed by injection providers, monthly monitoring, in-depth interviews, focus group discussions at the end of the study, and a survey of CHCs before and after the study period.

### Results

After six months, there was significant improvement in medical waste disposal practices in the participating CHCs of Huong Khe District. Groups 1 and 2—those that used needle removers, needle pits, and safety boxes—showed significant improvements in waste disposal resulting in safer CHC environments. Group 3 showed improvement in medical waste disposal practices, such as segregation. This change was attributed to increased supervision and information sharing with health workers from the Group 1 and 2 facilities.

Of health workers who were interviewed, 86 percent assessed the needle removers' function as good or very good, while 14 percent assessed them as average. Health workers reported that needle removers were simple and easy to operate, easy to clean, and safe and effective for the treatment of contaminated syringes. Results of in-depth interviews and focus group discussions showed that usage of needle removers had become routine in the CHCs that used these devices.

At the end of six months, 25 out of 32 of the needle removers distributed were considered to be in good condition. Due to irregular maintenance, three needle removers were jammed or rusted, and one became unusable during the study period. Health workers also reported that the needle removers were not compatible with certain syringes, as the hole in the needle remover was not large enough to insert the hub of the syringe.

## **Discussion**

There is an opportunity for significant improvement in the management of medical waste at CHCs. Needle removers have been evaluated as a technically appropriate and feasible solution for CHCs, accepted by most health workers and managers, and able to address problems of health care waste disposal in rural areas. Based on the results of this demonstration project, the evaluation team recommends broader introduction of needle removers in CHCs located in rural and mountainous regions of Vietnam. Training and maintenance are critical issues for ensuring successful introduction of needle removers. Should they be introduced more broadly, it would be important to strengthen supervision at the CHCs. Before the BMDi device (or any other model) can be introduced more broadly, an evaluation must be conducted to ensure that it is compatible with the types of syringes being used in Vietnam.

Safety boxes continue to be an important tool for managing sharps waste in Vietnam. However, unreliable supplies (safety boxes are only supplied for immunization injections) and lack of final disposal options present challenges for use. Since this study was completed, needle removers have recently been included in draft health care waste management guidelines developed by the Ministry of Health as an option for sharps waste handling in CHCs in Vietnam.

## 1. Background

Each year, more than 16 billion injections are administered worldwide. The World Health Organization (WHO) estimates that more than 50 percent of injections given in developing countries are unsafe.<sup>1,2</sup> In general, a safe injection is one that is administered using the appropriate equipment and does not harm the recipient, expose the provider to any avoidable risks, or result in waste that is dangerous for the community.

Globally, unsafe injections account for 33 percent of new hepatitis B infections, 42 percent of new hepatitis C infections, and 2 percent of new HIV infections.<sup>3</sup> To decrease the risk of disease transmission from unsafe injections, WHO guidelines recommend using autodisable (AD) syringes where possible and disposing of used syringes and needles in cardboard safety boxes that are then usually burned or incinerated. In developing countries, where reuse is most prevalent, safe sharps-disposal policies and practices are often inadequate. Assessments in China, India, and six African countries showed that health workers often mix sharps waste into other waste streams, dispose of waste haphazardly in and around their clinics, and do not have regulated systems for safe disposal of sharps waste for all injections.<sup>4,5,6</sup>

In several recent field evaluations, manual needle removers have been found by health workers to be a durable and acceptable alternative means of managing sharps waste by providing immediate isolation of the used sharp and preventing syringe reuse—the primary transmission risk of bloodborne infection. Preliminary results from a WHO evaluation in Madagascar suggest that there is a reduction in the number of safety boxes required by facilities using needle removers. They also found no increased risk of needlestick injury.

Injection providers use these devices immediately after the injection to remove the needle from the syringe and contain it in a small, puncture-resistant container. The process results in two waste streams: the isolated needles and the “defanged” syringe barrels. The small volume of isolated needles may then be discarded in a well-protected needle pit, significantly reducing the burden of transport and decreasing disposal costs, as well as protecting the community from potential exposure to the sharps waste. Once defanged, the syringes are no longer considered sharps waste and can be collected either in a safety box or with other infectious waste in plastic bags, then disposed of by shredding and autoclaving, incinerating, or through plastics reprocessing.

### Injection safety and health care waste management in Vietnam

The National Immunization Program (NIP) of Vietnam has recently begun to focus on injection safety and in January 2003 introduced AD syringes at all levels. An application to the GAVI Alliance for injection safety support was approved in February 2003 and allowed for the provision of funds in lieu of supplies, taking advantage of Vietnam's capacity to produce both AD syringes and safety boxes. Nevertheless, a national Expanded Programme on Immunization (EPI) review in November 2003 found several weaknesses in the areas of injection safety and proper waste management. Specifically:

- Safety boxes were not always readily available or used correctly, with some inappropriate practices including overfilling, transferring syringes from temporary boxes or bags, and emptying and reusing safety boxes.
- Immunization waste was reportedly destroyed in a number of ways, including open burning and burial, burial without burning, use of unprotected shallow pits, and, less commonly, incineration. Still, the survey team found used syringes and needles in areas of public access and noted that the methods of disposal are not always safe.<sup>7</sup>

One of the key recommendations resulting from the review was that the NIP should study the most appropriate, effective, and acceptable method for destroying injection waste in various Vietnamese settings, especially at the commune level. One of proposed methods for managing EPI waste disposal was to use needle removers at the commune level.

## 2. Methodology

### 2.1 Objectives

The objectives of this study were to assess the appropriateness, acceptance, and effect of needle remover use at the commune level.

This study also aimed to document and evaluate the occurrence of needlestick injuries during this project's implementation.

### 2.2 Research design

This six-month demonstration study was conducted in Huong Khe District, Ha Tinh Province, Vietnam, between June and December 2005.

The 23 commune health centers (CHCs) participating in the study were divided into three groups:

Group 1—Eight CHCs using needle removers.

Group 2—Eight CHCs using safety boxes.

Group 3—Seven CHCs using existing practices.

Throughout the demonstration project, participating CHCs were monitored for health care waste management (HCWM) practices including the use of needle removers and safety boxes, safe injection practices, sharps-disposal practices, and the occurrence of needlestick injuries.

### 2.3 Research sites

This study was conducted in the mountainous district of Huong Khe, Ha Tinh Province, where there was a significant need to improve HCWM practices. This was also the district where PATH provided technical assistance for supportive supervision of expanded immunization work, including conducting regular site visits.

Huong Khe is made up of 23 communes. Each commune has a population of about 3,000 to 5,000 inhabitants, and each CHC performs on average 50 to 80 immunization injections per month. Immunization injections are given at monthly vaccination sessions for one or two days per month. Curative injections are administered daily, resulting in up to 220 to 250 injections per month.

### 2.4 Supplies

#### Needle removers and protected sharps pits

The needle removers used in this study were Nomoresharps® devices, manufactured by BMDi Pty Limited (Nomoresharps is a registered trademark of BMDi.). The needle remover is stainless steel 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. The needle container holds 250 to 300



**BMDi Nomoresharps  
Needle Remover**

needles. The device measures approximately 13 cm x 15 cm x 8 cm and weighs 850 g with an empty container. Cost was approximately 330,000 VND per device or US\$22.

Before introducing needle removers into eight CHCs, protected sharps pits were constructed at each center. The cost was approximately 1,700,000 VND per pit or US\$106. It is estimated that a pit could be used for 15 to 20 years.

### **Safety boxes**

Prior to the study, CHCs had been provided with adequate safety boxes for immunization use. Normally, each center was supplied with 18 safety boxes per year or 1.5 boxes per month. During the study, centers in Groups 1 and 2 were supplied with adequate safety boxes for both immunization and curative injections (Group 3 was supplied with safety boxes for immunization only). Health workers estimated that two to three safety boxes per month would be enough for both immunization and curative injections. For this study, facilities in Groups 1 and 2 were supplied with 24 safety boxes each.

## **2.5 Description of study interventions**

Interventions differed between research groups.

### **Group 1—CHCs that used needle removers**

The eight CHCs that used needle removers were trained on safe injection, use of needle removers, use of safety boxes, and management of needlestick injuries. Health workers were asked to fill in log books to record injection-related practices, use of equipment, and needlestick injuries. Supervisors visited the communes each month to provide refresher training, if needed, and compile monitoring forms.

Each CHC that used needle removers was supplied with adequate devices for both static and outreach services. Staff from these communes used needle removers to immediately separate the syringe from the needle after injection. Sharps waste was disposed in concrete-protected sharps pits installed prior to the study for the disposal of removed needles. Syringes separated from their needles were inserted into the safety box and destroyed using existing practices, mainly burning and burying behind the health center. These communes were given an adequate supply of safety boxes for both immunization and curative purposes during the demonstration period.

### **Group 2—CHCs that used safety boxes**

The eight CHCs that used safety boxes only were trained in safe injection practices, use of safety boxes, management of needlestick injuries, and use of needle remover devices (though the devices were never introduced in the facilities). Health workers were asked to fill in log books to record injection-related practices, use of safety boxes, and needlestick injuries. Supervisors visited the communes each month to provide refresher training, if needed, and complete monitoring forms.

CHCs that used safety boxes were given adequate supplies of safety boxes for both immunization and curative purposes throughout the entire demonstration period. Safety boxes were destroyed using existing practices, mainly burning and burying behind the health center.

### **Group 3—CHCs that applied existing practices**

Seven CHCs applied existing practices and were not trained before the study's implementation. These centers were supplied with safety boxes for the immunization program only in accordance with existing practices. Injection providers did not have to complete any forms. Every month



supervisors visited these centers and completed a monitoring form. Supervisors did not provide training.

Safety boxes were destroyed in accordance with existing policies, mainly burning and burying behind the CHC.

After completion of this study, these communes were trained in safe injection practices, medical waste disposal, and management of needlestick injuries.

## **2.6 Participants of the study**

A total of 92 CHC heads and injection providers from 23 communes of Huong Khe District participated in the demonstration project. On average, there were four to five health workers giving injections (both EPI and curative) in each CHC, including the CHC head. Roles of the research subjects are described below.

### **Injection providers**

#### ***Group 1 and Group 2—Health facilities that used needle removers and/or safety boxes***

Injection providers used needle removers and/or safety boxes and completed data collection forms daily. At the same time, injection providers reported and recorded needlestick events. Before the project started, they had participated in training on safe injection and the use of needle removers. The injection providers also took part in pre- and post-demonstration project focus group discussions.

#### ***Group 3—Health facilities that applied existing practices***

Injection providers were to complete their daily tasks following existing practices. During monthly supervision visits, these staff were observed and were asked to answer questions regarding existing practices.

### **Heads of CHCs**

#### ***Group 1 and Group 2—Health facilities that used needle removers and/or safety boxes***

Heads of CHCs compiled log books of injection providers' data collection forms to ensure their records were correct. Heads of CHCs were responsible for repairing any damage to the needle removers or for providing replacement devices that were kept in store. Heads of CHCs who also gave injections were responsible for completing data collection forms the same as injection providers. Every month, heads of CHCs were to meet with their supervisors to discuss the usage of the equipment and CHC waste-disposal practices. In addition, heads of CHCs had the responsibility to support and provide guidance to health workers in cases of needlestick injuries.

#### ***Group 3—Health facilities that applied existing practices***

Heads of CHCs performed their daily tasks following existing practices. In addition, heads of CHCs met with their supervisors monthly to discuss CHC injection and waste disposal practices.

All research subjects agreed to be photographed to document injection and waste disposal practices.

### **Research implementers**

**Research supervisors** included PATH staff (project field staff) and provincial and district staff. The group of supervisors visited each project site once a month to complete monitoring forms and provide refresher training as needed.

**The district coordinator** was responsible for compiling the data collection forms at monthly review meetings and entering data into the central database.

## **2.7 Data collection**

Data was collected through daily logs completed by injection providers, in-depth interviews with CHC heads and injection providers before and after the study, focus group discussions before and after the study, monthly monitoring information collected by research supervisors, and a survey of health care waste management practices before and after the study.

## **2.8 Ethical considerations**

The NIP reviewed and approved the study protocol for ethical considerations. The protocol was also reviewed and approved by PATH's Human Subject Protection Committee. Informed consent was obtained from all participants.

## **3. Results**

Research results are presented in four main topics areas:

1. Use of needle removers.
2. Acceptability of needle removers.
3. Effect of needle removers on medical waste disposal.
4. Needlestick injuries.

### **3.1 Use of needle removers**

Results of in-depth interviews (28) in communes that used needle removers showed that the devices were used mainly in the health centers and sometimes at outreach points. Of the 28 interviewees, 32 percent (9/28) reported using the devices for injections during outreach. During focus group discussions, two participants expressed that the needle remover was not comfortable to carry for outreach.

CHC heads confirmed that needle removers were always available for use. Each center was supplied with four needle removers: most had one or two of these in use with the others stored in cabinets and available if needed. One center used all four needle removers. Needle removers were regularly located on the injection table.

Despite device availability, supervisors reported needle removers were not always used in two of the communes. In these communes, needle removers were not used in an estimated 15 to 20 percent of curative activities. In these cases, rather than using needle removers, the syringes were inserted directly into the safety box.

It is estimated that each device was used for an average of 35 injections per month with a total number of 3,401 needles removed during the study period.

#### **Needle remover function and maintenance**

Of the health workers interviewed, 86 percent assessed the needle removers' function as good or very good, while 14 percent of health workers (located in two of the eight facilities) assessed them as average.

A number of health workers stated that the needle removers had certain disadvantages related to their maintenance. Due to irregular maintenance, three health workers reported that the needle removers became stuck and rusted, rendering them unusable. One health worker reported that the device leaked.

Regarding maintenance regulations for the needle removers, each CHC assigned a staff member who had the responsibility of monthly maintenance. During the process of operation, some needle removers became rusted around the cutting hole due to poor maintenance. After six months of use, only 1 of the 32 needle removers that were distributed was unusable. Of the 28 needle removers observed, 25 (80 percent) were in good condition and 21 (67 percent) of the devices were described as clean by the supervisors at the end of the study.

### **Needle remover compatibility with syringes**

All commune health workers interviewed reported problems using the needle remover with the new AD syringes (K1) being produced in Vietnam. This syringe has a plastic skirt that fits over the needle hub to prevent the needle from being removed. This skirt fit snugly into the needle remover hole and often became stuck there when the needle was cut. It seemed to create a spring that would frequently propel the needle back out of the needle remover hole. The plastic skirt would also sometimes remain jammed in the hole. If the syringe skirt was not inserted into the needle remover hole, the cut left a sharp needle stub at the end of the needle.

K1 syringes (with the plastic skirt) were used only for immunization. At the time of the study, only 30 percent of the syringes used in immunization were this type. The immunization injections accounted for approximately 20 percent of total injections. To address this issue, supervisors trained the health workers on how to address this problem. The operator needed to shake the handle one or two times for cut pieces to fall into the removable plastic debris pot before releasing the handle for the next cut. This training was found to be successful in eliminating the problem.

### **Disposal of needles in protected sharps pits**

All commune health workers reported the protected sharps pit as the safest solution for disposing of removed needles. Needle containers were emptied into needle pits when full; containers were cleaned with detergents for reuse. Seven of the eight CHCs had been using needle pits. One center had not yet used the sharps pit as cut needle debris had not filled the containers of the needle removers. It was at this same health center that injection providers had been observed using safety boxes for some curative injections. Pits were used properly, without other waste. Although water covered the area around the pit during the rainy season, the area dried up several days after the rain—not affecting the use of the needle pits.



**Protected Sharps Pit In Use**

### **3.2 Acceptability of needle removers**

Needle removers were evaluated as appropriate for use in CHCs by health workers during in-depth interviews and focus group discussions. With the prevalence of unsafe disposal practices, needle removers were felt to be especially necessary to reduce the risk of needle reuse and needlestick injury.

Nearly all (93 percent, 26/28) health workers interviewed preferred to use needle removers compared to previous practices, of which regular users had a higher acceptance rate compared with infrequent users. Health workers reported the needle removers were easy to operate, safe, and not time consuming. They reported wanting to continue using the devices after the study concluded.

Health workers considered the use of needle removers the most appropriate solution currently available at the commune level, as they had some prominent advantages, such as having very good

cutting function, simple design, being easy to use, smooth to operate, highly effective, and safe for users and for the community. They also hoped to be able to use both needle removers and safety boxes.

Two health workers reported that they considered using safety boxes enough and thought the cutting operation not necessary. These two staff were from the health center that was observed using the devices irregularly.

The following tables lists some of the advantages and disadvantages of needle removers and safety boxes identified by Groups 1 and 2:

**Table 1. Summary of advantages and disadvantages of needle removers and safety boxes**

	<b>Group 1—CHCs that used needle removers</b>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>▪ Safe, able to separate syringes/needles, avoids littering.</li> <li>▪ Safe isolation of needles.</li> <li>▪ Easy to collect and treat used needles.</li> <li>▪ Able to reduce quantity of safety boxes used.</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>▪ Devices rusted easily.</li> <li>▪ Needles were easily stuck in cutter.</li> <li>▪ When cutting, the new K1-type syringes/needles sometimes popped out of the cutter.</li> <li>▪ Reusable needle containers would sometimes cause needles to spill if not opened carefully.</li> <li>▪ Devices require more steps to disposal and therefore take more time.</li> <li>▪ There were too many forms to be filled out (during the implementation period).</li> <li>▪ Budgets for constructing syringe/needle disposal pits were too high for the centers.</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>▪ Provide lubricant/grease for maintaining needle removers.</li> <li>▪ Supply additional needle containers to allow for disposal of container.</li> <li>▪ Provide instructions for dealing with stagnant water during construction of the needle pits.</li> <li>▪ Make devices appropriate to all types of syringes/needles.</li> </ul>
	<b>Group 2—CHCs that used safety boxes</b>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>▪ Safe.</li> <li>▪ Easy to put together and easy to use.</li> <li>▪ Can be used daily: convenient for injections both in and outside of the center.</li> <li>▪ Easy to destroy.</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>▪ The hole for inserting syringes/needles is too small.</li> <li>▪ Due to the duration that a safety box is in use before becoming full (CHCs burn only full safety boxes), fluids leaked out, causing poor hygiene.</li> <li>▪ Difficult to burn during the rainy season.</li> <li>▪ Difficult to fully burn needles, leaving fragments in discarded ash.</li> <li>▪ Cost of fuel to burn safety boxes.</li> <li>▪ The quantity of boxes was usually only enough for immunization needs, so when boxes became full they would be emptied and reused.</li> </ul>

<b>Recommendations</b>	<ul style="list-style-type: none"> <li>▪ Provide adequate supplies of safety boxes for both immunization and curative injections.</li> <li>▪ Supply gloves for operators who treat waste to ensure safety and hygiene when gathering and burning.</li> <li>▪ Designate funds in budgets for fuel to burn safety boxes.</li> <li>▪ Designate funds in budgets for constructing waste disposal pits with roofs to avoid wet conditions, especially during the rainy season.</li> </ul>
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### 3.3 Effect of needle removers on medical waste disposal practices

#### Baseline survey summary

Before the demonstration project implementation, a baseline survey was conducted in 12 of the 23 study facilities by PATH and the NIP in Ha Tinh Province to document the existing practices in the study area. This survey showed that waste disposal was one of the areas that should be addressed urgently at all levels, especially at the commune level. A few CHCs had used safety boxes but only for immunization waste—no CHCs used safety boxes in outreach immunization sessions. Syringes from curative injections were often thrown into plastic garbage buckets after use, placed in corners of injection or treatment rooms, and then thrown into garbage pits behind the CHC. Many centers and the district hospital used pliers to separate the needle from the syringe and then would isolate the needle in an empty bottle of IV fluid; syringes would then be sold for recycling or thrown into the hospital’s waste area. Some health workers bent used needles before discarding them in garbage buckets. Safety boxes were often placed in unsafe locations, such as the head of a patient’s bed or in the corners of treatment or injection rooms. Sharps wastes and other medical wastes were commonly destroyed by burning in the open air or by burying. Burning sites were commonly close to the CHC, to the road (where students would pass by), or in a field. During the rainy season waste burning was extremely difficult, and it was possible to see unburned or partly burned syringes/needles and broken glass vials at nearly all waste disposal sites.

#### Changes after six months of the project

After the six-month study period was complete, a post-study survey similar to the baseline was conducted in 18 of the study sites (7 from Group 1, 6 from Group 2, and 5 from Group 3). Positive and clear changes in medical waste disposal and safe injection at these CHCs were observed and recorded.

#### *Medical waste disposal practices*

Of 18 CHCs, 17 had segregated solid waste as regulated by the Ministry of Health, and 16 out of 18 CHCs had segregated syringes/needles from medical waste. Most CHCs were using safety boxes to contain syringes/needles (17 of 18 centers). Out of 17 CHCs, 13 used safety boxes for both curative and immunization areas and 6 out of 18 CHCs (all from Group 1) reported safely treating used syringes/needles. Four of 18 centers had hygienic garbage pits with a protective roof, without contaminated syringes/needles or waste on the surface, and where waste had been almost immediately burned. The presence of contaminated syringes/needles and other medical waste on the pits surface had been significantly reduced, demonstrating improved safety for patients, health workers, and the community.

#### *Safe injection practices*

There was no evidence of selling used syringes/needles at any of the CHCs at the end of the study compared to observation of this practice at 6 out of 12 facilities before the start of the study. Only

one CHC was observed with contaminated syringes/needles on the injection tables. Most centers had established a monitoring system for occupational accidents caused by sharp objects. It is estimated that 75 to 90 percent of contaminated syringes/needles from curative and immunization areas were removed, reducing the risk of reuse or injury in Group 1 facilities.

Table 2 below summarizes some of the safe injection and medical waste practices observed before and after the study period.

**Table 2. Summary of key changes in waste disposal and safe injection practices**

CHC No.	Practice observed	Before the study	After the study		
		District CHCs (12/23)	Group 1 CHCs using needle removers (7/8)	Group 2 CHCs using safety boxes (6/8)	Group 3 CHCs using existing practices (5/7)
<b>Medical waste disposal</b>					
1	Segregation of solid waste as regulated.	25% (3/12)	100% (7/7)	100% (6/6)	80% (4/5)
2	Segregation of syringes/needles from solid waste.	50% (6/12)	100% (7/7)	83% (5/6)	80% (4/5)
3	Use of safety boxes.	83% (10/12)	100% (7/7)	100% (6/6)	80% (4/5)
4	Safe treatment of used syringes/needles.	0% (0/12)	86% (6/7)	0% (0/6)	0% (0/5)
5	On-site hygienic waste burning pits with regular operation.	0% (0/12)	43% (3/7)	0% (0/6)	20% (1/5)
<b>Safe injection</b>					
6	Signs of selling used syringes/needles.	50% (6/12)	0% (0/7)	0% (0/6)	0% (0/5)
7	Contaminated syringes/needles on the injection tables.	25% (3/12)	0% (0/7)	17% (1/6)	0% (0/5)
8	Needlestick injuries reported.	17% (2/12)	14% (1/7)	0% (0/6)	20% (1/5)
9	System to monitor needlestick injuries in place.	0% (0/12)	86% (6/7)	50% (3/6)	40% (2/5)

### 3.4 Needlestick injuries

During the six-month study period no injuries were reported to the research supervisors and no injuries were reported during the focus group discussions. However, during in-depth interviews with health workers at the end of the study, two needlestick injuries were reported (one injury occurred in a CHC that used needle removers and one occurred in a CHC that applied existing practices). Both of these needlestick injuries occurred before giving the injection (during vaccine preparation).

## 4. Discussion

### 4.1 Improvements in medical waste disposal

There has been a positive change in medical waste disposal at the CHCs of Huong Khe District due to the training and implementation of safe injection practices and strengthening of supervision through this study.

There is a clear difference in the effectiveness of the different medical waste disposal methods of the three study groups. Improvements in medical waste practices were much greater in Groups 1 and 2 compared to Group 3. It is likely that medical waste practices improved in Group 3 (existing practices) due to the increased attention on medical waste supervision and interchange with adjacent health centers in the other two groups.

Group 2 facilities felt use of safety boxes alone provided a satisfactory medical waste solution, however it should be noted that the study provided an adequate supply of safety boxes for all injections (immunization and curative) during the study period. Safety box shortages are a potential weakness to the safety-box-only approach since safety boxes are supplied by the immunization program only for immunization injections. Other weaknesses attributed to the safety-box-only group include: inability to burn boxes during the rainy season thereby increasing the possibility of boxes breaking open, being improperly stored, the likelihood that safety boxes will be opened and emptied out for reuse, and the possibility that safety boxes filled with non-autodisable syringes (currently used in curative sector) could be collected for reuse. For these reasons the needle-remover approach may provide a higher level of medical waste safety for health workers, supervisors, and ministry of health decision-makers.

Health workers in Group 1 facilities had accepted and hoped to be able to continue using the needle removers, as they found these devices simple, easy to operate, easy to clean, safe, and effective for the treatment of contaminated syringes/needles at the CHCs and in the community.

### 4.2 Needlestick injuries

Before the start of the needle remover demonstration project, there was no system in place for reporting needlestick injuries in Vietnam. Prior to the start of the project, training was provided on how to report needlestick injuries, and CHC heads were given needlestick injury report forms to complete. During the course of the study, there was no formal reporting of injuries or completion of injury report forms. It was only after the study was completed that two injuries (which occurred before the injection during preparation of the dose) were reported during private, confidential interviews. The awareness of the risk of needlestick injury continues to be very low so there is no emphasis on reporting. This study has raised some awareness, and there is hope that the reporting system will remain in place. However, stigma remains an issue, and health workers are still hesitant to report injuries for fear that they will be seen as not doing their job correctly. More work must be done to reduce stigma and implement a support mechanism to encourage health workers to report needlestick injuries.

### 4.3 Recommendations

Below are some specific recommendations that resulted from this study:

- The removable plastic needle container on the needle remover should be made to be disposable and not reused. Needle container could be replaced monthly depending on volumes.
- It is crucial to strengthen training and supervision on needle remover use and maintenance, provide materials to improve the maintenance of devices, and train new staff.

- The cutting hole on the needle remover should be resized to prevent needles from popping out.
- It is necessary to strengthen training and supervision on medical waste disposal.
- Each CHC must be supported with a budget for constructing waste pits with roofs and walls to facilitate waste management and ensure waste is dry and easy to burn during the rainy season.

#### 4.4 Summary

There is an opportunity for significant improvement in the management of medical waste at CHCs. Needle removers have been evaluated as a technically appropriate and feasible solution for CHCs, acceptable by most health workers and managers, and a viable option to address problems of health care waste disposal in rural areas. Based on the results of this demonstration project, the evaluation team recommends broader introduction of needle removers to rural and mountainous CHCs of Vietnam. Training and maintenance are critical to ensuring the successful introduction of needle removers. Should they be introduced more broadly, it would be important to strengthen health care waste management supervision at the CHCs. Before the BMDi device or any other model can be introduced more broadly, an evaluation must be done to ensure it is compatible with the types of syringes being used in Vietnam.

Safety boxes continue to be an important tool for managing sharps waste in Vietnam. However, unreliable supplies and lack of final disposal options present challenges for use. Since this study was completed, needle removers have recently been included in draft guidelines as an option for sharps waste handling in CHCs in Vietnam.

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