

HIDDEN REALITY ON THE INTRODUCTION OF AUTO-DISABLE SYRINGES IN DEVELOPING COUNTRIES

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Abstract. With the growing concerns about the risk of unsafe injections (*eg* unsterilized injection practices), WHO, UNICEF and UNFPA decided to introduce the auto-disable (AD) syringe for immunization in the world. The AD syringe is designed to be automatically locked after a single use, hence no chance of reuse. Consequently, the risk of infection can be reduced for the recipient. On the other hand, the management of increased medical waste is becoming difficult, as the waste volume of AD syringes would be 200 times as much as those of sterilizable syringes. The used and improperly disposed AD syringes could be a huge source of blood-borne infections and environmental pollution at the community level. This study attempted to explore the present situation with regard to the introduction of AD syringes for immunization in Lao PDR. We conclude that reviewing the present 'safe injection' policy is urgently required in Lao PDR, as well as in other developing countries where the disposal system for medical wastes is not yet well established.

INTRODUCTION

Syringes can largely be divided into two types: sterilizable and disposable. Although sterilizable syringes have been widely used for immunization in developing countries, with a lack of proper training in sterilization, transmission of blood-borne diseases became a major public health concern in the 1980s. At that time, conventional disposable syringes became popular as a way to reduce the risks associated with improper sterilization practices (Battersby *et al*, 1999). Unfortunately, these syringes were widely misused or reused, as well as improperly disposed of, which may be responsible at least 4 million cases of viral hepatitis B, plus unquantified numbers of hepatitis C and HIV infections, abscesses and cases of septicemia (Simonsen *et al*, 1999). Consequently, the new disposable syringes, AD syringe, were believed to be the best way to reduce the above infections (WHO, 1999).

In Lao PDR, sterilizable syringes have been used for immunization and the conventional ones for treatment at health facilities. The AD syringe was first introduced in 2000 for the pilot measles mass vaccination campaign in two out of 18 provinces. The campaign was implemented as an initial step for measles elimination, and the target population was children under five, regardless of vaccine/measles history. It was expected that the AD syringes would facilitate the vaccinators to cover the number of children during the campaign (WHO, 1997), which were 4 times as many as those receiving routine vaccinations. Furthermore, the Global Alliance for Vaccines Initiative (GAVI) decided to support the new quadrivalent vaccine (DPT and hepatitis B) on the condition they use the AD syringes to reduce the vaccine wastage (Wittet, 2001). There was concern that all the sterilizable syringes for immunization, including for measles and BCG, might eventually be replaced with AD syringes, leading to confusion within the immunization system managed by the Ministry of Health, Lao PDR. Another important problem is that there would be no funds for the expensive AD syringe after the withdrawal of GAVI.

This study was, therefore, conducted to examine the appropriateness of introducing the AD

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syringe into Lao PDR. The main study components were; 1) monitoring the use and disposal of AD syringes during the mass measles vaccination campaign, 2) burning test of the safety box following WHO guidelines, 3) investigation of medical waste management in health facilities.

MATERIALS AND METHODS

This was predominantly qualitative research, based on reviews of available data/reports, interviews and observations.

Monitoring the use and disposal of AD syringes

During 2000s pilot campaign, it was reported that 11,020 of a total of 25,900 AD syringes (43%) in Phongsaly Province were unused (Noguchi, 2000). In March and April 2001, the campaign was expanded to all provinces other than the two pilot provinces. We visited the Sobbao District of Houaphan Province in northern Lao PDR, upon completion of the campaign. We interviewed the director, EPI manager, three EPI staff at the district hospital, and a health worker who used the AD syringes in the remote mountainous area during the campaign.

Burning test of the safety box

The burning test was carried out following the WHO guideline (Prs *et al*, 1999a), on 21 June 2001, at Nongniow Health Center in the Vientiane Municipality. Six safety boxes, each of which contained about 100 used AD syringes, were used here.

Investigation of medical waste disposal at health facilities

For this study component, a field visit to Vientiane Municipality (6 hospitals) and Xiengkhuang Province (three hospitals and three health centers) was accomplished in September 2001, where we interviewed the directors, staff in charge of medical waste management, and the Japan overseas cooperation volunteer (JOCV) nurses working there.

RESULTS

Monitoring the use and disposal of AD syringes during the mass measles vaccination campaign

AD syringes were generally popular among

health workers because they did not have to carry equipment for sterilizing syringes and needles, they could just throw the used AD syringes into 'safety boxes' made of carbon. A health worker mentioned that when he visited 9 remote villages with 3 safety boxes, he found it difficult to carry around and dispose of the filled boxes. Once a box became full, he dug a hole to burn it, following the WHO guidelines (Prs *et al*, 1999a). He complained it was exhausting, as it took two hours just to dig the hole. After burning the boxes, the remaining space in the hole was utilized to put other medical wastes, which can cause severe problems (see the next section). In other remote villages, the safety boxes were buried without burning. In urban areas, the filled safety boxes were brought back to the hospital and burned in a shallow hole on the hospital grounds. Here again, they did not cover the hole with soil after burning, while lots of needles remained in the ash, sharp enough to prick paper or skin, and could hurt the bare footed children walking around the hole.

As was stated in an earlier report in Phongsaly Province (Noguchi 2000), this study observed many AD syringes left unused in the storage of the district hospital. The staff mentioned that this situation was due to excess syringes, because of a fear of shortages. These findings confirm difficulties arising from the logistics of the AD syringe, as have been reported in other countries (Ministry of Health and Family Welfare, 1998; Battersby *et al*, 1999).

Burning test of the safety box following WHO guideline

First, one hole, 1x2x1m was made in the ground (Fig 1). The digging cost was quite high (US\$12), considering the average monthly salary of the health center staff, which is about US\$20. It took one hour for the burning test, until the flame went out. The plastic syringes were burnt completely, though we found many empty vials left in the ash (Fig 2). These vials should not have been put in the boxes, as they can spatter in the flame. If these boxes were burnt in incinerators, the walls could have been damaged. In the rainy season, it is practically impossible to use these holes for burning, as the blood-stained AD syringes and other medical wastes will float

in the rainwater in these holes, and eventually overflow (Fig 3). It can be dangerous, not only because the syringes in the ground may hurt the feet of people living nearby, but also because the water with blood or other chemicals may go into the ground, reaching drinking water sources.

Investigation of medical waste disposal at health facilities

Table 1 summarizes the availability of incinerators and the conditions of waste separation at the studied health facilities. Only two health centers had functioning incinerators: one throughout the year and the other only in the dry season. The main reason why they are functioning so well is the small number of syringes (less than 10 syringes/day) needing incineration. If AD syringes were to be introduced for all immuniza-

tions, the volume of used syringes would be beyond the capacity of these incinerators. The operations and maintenance costs for the incinerator are the major constraints, as was the case at Sethathirath Provincial Hospital.

Waste separation at the health facilities is also important, so as to minimize the quantities of hazardous wastes (Prs *et al*, 1999b). At the studied health facilities, waste separation was done well, responding to the healthy city program by the MOH, Lao PDR in 1999. The JOCV nurses also contributed to raising awareness of the importance of waste separation, through discussion at the annual national conferences since 1995, as well as through a survey at the Friendship Hospital, which revealed the possible correlation between the high rate of hepatitis B infection and

Table 1
Medical waste disposal at the study health facilities.

Name	Type	Incinerator	Waste separation	Collection by car?	Place of disposal?
Vientiane Municipality					
Mahosot	National hospital	x	○	Collecting general and medical wastes separately	Central dumping sites
Friendship		x	○		
Sethathirath	Provincial hospital	Nonfunctioning	○	Collecting general and medical wastes together	
Sikhottabong	District hospital	x	○		
Xaythany		Nonfunctioning	○		
Saisetta		x	○		
Xiengkhuang Province					
Xiengkhuang	Provincial hospital	Nonfunctioning	○	No system of collecting wastes	Burn and bury in a shallow hole on the grounds
Paraxay	District hospital	x	○		
Kham		x	△		Same as above (in dry season only)
Lasen	Health center	x	○		Burn on the grounds
Nong		○	○		Use an incinerator
Nopa		Nonfunctioning in the rainy season	△		Dry season: incinerator Rainy: bury in the backyard

x = None; ○ = Yes; △ = Some mixing of waste, infectious waste mixed with general waste.



Fig 1—Burning test of safety box filled with used AD syringes.



Fig 2—Used vials in the safety box.



Fig 3—Medical wastes floating in the hole in the rainy season.

injections (Asatani, 1998). Yet, waste separation at dumping places was still poor, even in the Vientiane Municipality. In rural areas, where there is no garbage collecting system, the medical wastes are burnt in an incinerator or in a hole on the grounds of the health facilities. At the Xiengkhuang Provincial Hospital, however, the

staff are faced with the difficulty of finding a place to burn/bury lots of medical waste produced by the treatment of large numbers of patients.

DISCUSSION

This study explored the possible, but often hidden, problems associated with the introduction of AD syringes. A new technology, such as AD syringes, can reduce the burden of the health worker (no need for sterilization), but we should not ignore other burdens, such as the difficulty of waste management and disposal. The survey conducted in Kenya by JICA revealed this difficulty (JICWELS, 2003); AD syringes were introduced for the mass measles vaccination campaign, however, lots of AD syringes were left unused and they began to use them for other routine immunizations. In this way, all the immunization syringes were replaced with AD syringes. Consequently, now, the health staff refuse to use sterilizable syringes, and there are piles of improperly disposed AD syringes.

Once AD syringes are introduced for all immunization service in a country, it is predictable that infections and environmental pollution will increase, even at the community level, due to the improper disposal of the huge numbers of used AD syringes, which can be 200 times as many as sterilizable ones (Battersby *et al*, 1999). The amount of expired AD syringes can also be tremendous. Although the latest WHO guideline provides several options for disposal of AD syringes (WHO, 2002), we would like to warn that they are unrealistic for developing countries, especially in rural areas. For example, uncollected safety boxes, filled with blood stained used AD syringes, will pile up at district hospitals and health centers, because it is difficult to collect the boxes as instructed by the WHO (2002). Newly made incinerators, at provincial level, may be broken within a few years, because of the increased volume of syringes and other items incorrectly put into the incinerators.

There is confusion that most injection-related infections may be related to the immunization. This is not correct. More than 90% of injection-related infections are due to the improper use of conventional disposable syringes. As for immunization,

no injection-related infections have been reported in Lao PDR due to comprehensive training on the use of sterilizable syringes (Laurent 2000, Unpublished). As long as training is ensured, it is wise to keep using sterilizable syringes for immunization. It is impossible for developing countries, like Lao PDR, to sustain these expensive AD syringes by their governments, after the withdrawal of GAVI's support (Staring *et al*, 2002). Having replaced all the sterilizable syringes with AD syringes, these governments will face the difficulty of procuring the sterilizable syringes.

A new health policy is often introduced by the WHO and UNICEF, without full discussions with governments, NGOs, and ICC members. As a result, countries have been struggling with various problems, as in the case of AD syringes. Our latest study showed that the mass measles vaccination campaign was not an appropriate method for Lao PDR (Kuroiwa *et al*, 2003). Establishing ambitious goal may lead external policy makers to just pursue the improved indicators, overlooking accompanying problems. We would like to emphasize the reconsideration of our approaches to disease control, including safe injections.

Suggestions

- The preconditions of introducing the AD syringe should be regulated more strictly, and supplies should be immediately stopped to countries without proper disposal systems.
- Sterilizable syringes should be supplied with safe injection training packages.
- Conventional syringe disposal systems for hospitals should be developed (*eg* development of devices for disinfecting and disposing of used syringes).

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