Operation Red Box: A Pilot Project of Needle and Syringe Drop Boxes for Injection Drug Users in East Baltimore

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Summary: We assessed the acceptability and the use of a community-based needle and syringe disposal project designed to serve injection drug users. In June 1996, three surplus U.S. mail collection boxes were painted red and used as syringe and needle drop boxes in locations with high drug use in East Baltimore. Acceptance of the drop boxes was measured by focus groups of residents, drug users, and police, held before and after project implementation. Use was measured by weekly counts of needles recovered from the red boxes. A sample of all deposited needles was randomly chosen for needle washing and subsequent HIV antibody testing. Community impact was measured by systematic surveys of needles discarded on public sidewalks, in areas with and areas without drop boxes. Before implementation, members of focus groups expressed concerns that drop boxes could convey mixed messages to youth (e.g., seeming to condone drug use), might result in increased loitering, and could further community stigmatization. After project implementation, all focus groups expressed support of project expansion. In the first 10 months, 2971 needles were collected. Of 156 needles tested, 10.9% were positive for HIV antibody. Needle counts on the street showed no significant change in red box areas compared with control areas. In this pilot project, red boxes were accepted by the community and drug users. Police officers also used the boxes to dispose of confiscated needles. Although limited in the number of drop boxes and follow-up time, this pilot project shows promise as a community-based method of safe needle disposal. Key Words: HIV—Substance abuse—Intravenous drug use—Needle exchange program—Needle disposal.

In an attempt to reduce the risk of infection with HIV associated with injection drug use, the U.S. Public Health Service (1), the American Medical Association (2), the U.S. Preventive Services Task Force (3), and the United States National Academy of Sciences (4) recommend that persons who continue to inject drugs use a new needle and syringe (referred to in this paper as needle) for each injection. If followed, this recommendation would increase the number of used needles in and out of circulation, some of which could contain HIV or viral hepatitis.

By providing sterile needles in exchange for used needles, needle exchange programs (NEPs) have been established as one component of a comprehensive strategy to prevent the transmission of blood-borne infections, such as HIV and viral hepatitis, among injection drug users (IDUs). Because NEPs are commonly designed as one-for-one exchanges (i.e., one sterile needle is provided for each used needle returned), the number of needles discarded in public places, at least theoretically, should not increase. Systematic street surveys in Portland, Oregon (5), Toronto, Ontario (Toronto Department
of Public Works and the Environment—Operations Section, needles collected through the GTNOTS campaign, June 30, 1992 [unpublished material]) and in Baltimore, Maryland (6) have shown that the number of discarded needles found in public places did not increase with the introduction of NEPs.

In an attempt to decrease the number of discarded street needles in areas without NEPs and where paraphernalia laws are enforced, the Baltimore City Health Department (BCHD) initiated a pilot project called Operation Red Box, a needle disposal program based on a program in DeSoto County, Florida (7).

METHODS AND MATERIALS

Program Description

In June 1996, the BCHD obtained surplus U.S. mail collection boxes to be converted into needle drop boxes. The surplus boxes (~2.5 feet wide, 2.5 feet long, and 4 feet high) were donated to the city by the local post office. These types of boxes were selected as needle drop boxes because they had sturdy metal construction with a locked door for emptying, were equipped with another one-way door for receiving objects but through which objects could not be retrieved, and could be secured to sidewalks with bolts into cement. The first six boxes were painted burgundy red with "Baltimore City Health Department" in white letters. The boxes were then labeled with preprinted stickers that included diagrams warning against use by children and a BCHD phone number to be used for questions about the pilot program, to report needles discarded in public areas, for locating HIV testing sites, and for obtaining information on drug treatment referrals. The cost to convert four boxes (i.e., paint, stickers, bolts, cement, and labor) was $604 U.S.

To choose red box locations, the BCHD consulted with members of Baltimore’s NEP advisory board and several Baltimore community associations. The East Baltimore Midway Community (EBMC), covering 109 square blocks, was ultimately chosen as the area in which the pilot project would be conducted. At the time of project initiation, this area was not served by the Baltimore NEP, although the community considered it an area with a substantial number of IDUs. The EBMC Association chose the locations for red boxes, and community service organizations were consulted. Because of community concerns about stigmaatization voiced after choosing program sites, only three of the six originally planned red boxes were in place on the first day of operation, along with one additional site that was not originally planned. All four boxes were placed within a 10-block radius and were not spread proportionately throughout the EBMC area.

The Annotated Code of Maryland (crimes and punishment, article 27, sections 287, 287a, and 288) makes it a misdemeanor for a person to carry a hypodermic needle without an official card declaring that person to be a diabetic. The only exception to this law is a bill granting exemption to participants of the Baltimore City NEP. Because the BCHD designated Operation Red Box as an NEP affiliate, persons using the boxes were exempt from prosecution under paraphernalia laws. Users of the red boxes were not required to register with the BCHD to use the service. The boxes were accessible 24 hours each day, and no limits were set on the numbers or the types of needles disposed.

On June 17, 1996, the BCHD installed the red boxes on four street corners of the EBMC. These were corners of heavily traveled streets in an area of high injection drug use. Beginning July 3, 1996, the boxes were emptied once weekly by the BCHD and biweekly after 5 months of operation. The cost to empty all the boxes one time, including employee hourly wage, transportation mileage, and syringe incineration, was $12 U.S. (P. Belenson, Baltimore City Health Commissioner, personal communication, April 1997).

Evaluation Description

Evaluation of Operation Red Box was accomplished through holding focus groups, monitoring the weekly rate of disposed needles, determining HIV antibody prevalence through testing needles found in the boxes, and determining changes in the number and the distribution of discarded street needles before and after boxes were installed.

Focus Groups

Preintervention focus groups were conducted in June and July 1996, and postintervention groups were conducted in December 1996. All focus group participants signed an informed consent form and completed a brief demographic information form. The groups were tape recorded, with participants’ permission, and the tapes were transcribed for analysis. Responses were coded by the interviewer and organized into categories that had emerged during discussion groups.

Three types of focus groups were conducted: community residents, IDUs, and police officers. Community residents were recruited through the community association, the mayor’s outreach office, and neighborhood churches. Focus groups with community residents were held in the local community association office approximately 2 weeks before the red boxes were installed and 5 months after the boxes were installed. IDUs were recruited through substance use treatment centers, soup kitchens, and shelters in the area. Three focus groups were conducted with recent and active drug users 3 weeks before the boxes were installed and 5 months after the boxes were installed. Each focus group was held in a local soup kitchen and consisted of eight participants of various ages and ethnicities. Participants were reimbursed $15 for attending a focus group. Police officers were recruited from the precinct containing the red boxes, and focus groups were conducted at the Eastern District Police Department. Police focus groups were held 1 week after the boxes were installed and 5 months after the boxes were installed.

Red Box Use

Counts of all deposited needles were made each time the BCHD emptied the red boxes. All needles collected in the first 5 weeks were brought to the Johns Hopkins School of Hygiene and Public Health for HIV testing. After testing, all collected needles were disposed of as biohazardous waste.

HIV Antibody Prevalence Among Red Box Needles

Following the protocol used by Myers et al. (8), selected needles were rinsed with a buffer solution and tested for HIV antibody by an enzyme-linked immunosassay (ELISA, Abbott Laboratories, Chicago, IL, U.S.A.).

Intact needles were necessary for this testing protocol, and all were eligible for random selection, with one exception. In three instances, bags of >100 needles were deposited into a red box. When all needles were
were intact, 10 were selected at random to ensure that results did not oversample single individuals. The number 10 was selected on the basis of data from the Baltimore NEP; this was the average number of needles that exchangers reported using in 1 week during the month of June 1996.

**Number and Distribution of Discarded Needles**

Following the methods used by Doherty et al. (6), a survey team performed standardized counts of discarded street needles. Counts were conducted before and after the initiation of this pilot project to provide a comparison with a count of background trash (i.e., drug vials and soda bottles). The comparison provided a means of accounting for environmental change, such as neighborhood cleaning, and to account for observer practice effects.

The **sampling frame** consisted of the four original red box blocks (three in east Baltimore and one in west Baltimore) and two control blocks that were assigned to each red box block. Control blocks were matched to red box blocks to ensure comparability in drug use profiles between control and sample blocks. Matches were made for aggravated assault according to 1990 census tract data and for drug treatment admission rates (i.e., ±15 admissions/1000 residents) according to 1995 fiscal data from the Baltimore Substance Abuse System.

For **protocol standardization**, two systematic counts were conducted before the red boxes were placed in the EBMC, and two were conducted afterward. The preintervention counts and both postintervention counts were summed. The survey included the perimeter of the chosen block and alleys of that block. A team of three surveyors walked down the center of the sidewalk, counting the number of discarded needles, drug vials, and bottles. Only items that could be seen while walking were recorded; nothing was moved, turned over, or removed during the survey.

Sites surveyed for preintervention needle counts were also surveyed for postintervention counts. However, community opposition toward one of the four original red box sites (the west Baltimore site) led to the omission of this site and its corresponding two control blocks. This site, originally considered acceptable by the community during a meeting with the Commissioner of Health, was later considered unacceptable because of possible loitering and disturbance near the red box site. Opposition was voiced after the preintervention needle survey was conducted but before red boxes were placed in the community and before program initiation. The discontinued red box block and its controls were eliminated from analysis. The survey was able to collect preintervention and postintervention counts for three east Baltimore red box blocks and six control blocks.

Statistical analyses were conducted with SAS software (SAS Institute Inc., version 6.08 for Windows, Cary, NC, U.S.A.). χ² tests were based on likelihood ratios, and a Poisson distribution was used in regression models to accommodate count data.

**RESULTS**

**Preintervention Focus Groups**

**Community Resident Focus Group**

Six residents (all African American; 2 men; mean age, 54 years) from the red box community said that people in their neighborhood did not discuss discarded needles as a community concern, but most residents did report that they had seen needles in alleys and vacant lots. Participants recognized that needles on the street were dangerous but also acknowledged that the boxes might convey negative messages about their community.

The main concerns about the red boxes were that children might misinterpret the intentions of the red boxes, believing that the service condones drug use ("Children are nowadays doing whatever they see adults do."); that negative messages might be conveyed about the red box neighborhood ("I think it gives the community a bad name"); and that the boxes had the potential to attract more drug users and dealers to the area than were already there.

The main advantage was improving the community by addressing a problem that already existed and needed to be addressed ("We need to find solutions. This [situation] has been going on too long in the community for us not to try new ideas.").

**Injection Drug User Focus Groups**

Three focus groups, each consisting of 8 current and recent IDUs (24 persons; 22 African Americans; 17 men; mean age, 42 years) were asked to predict the use of the red boxes. Main reasons given for predicting a lack of use were fear of the police ("I don’t want to carry [needles] because you can get busted for dirty ones. That’s why I get rid of them."); not wanting to be identified as a drug user by depositing a needle into a red box on a busy street corner; having to go out of their way to use the boxes ("I’m not going to walk to no red box if I don’t have to."). Despite these concerns, reactions to the red box project were mostly supportive ("a good idea").

**Police Officer Focus Groups**

Two focus groups, one consisting of seven Eastern District police officers and one consisting of eight (15 persons, 6 African Americans, 13 men) were asked their opinions about the red box project. The main concerns were that the project would contribute to an overabundance of drug-related city programs ("I mean, if we do all this, we might as well make it legal."); that the boxes would not be used ("There are trash cans on every corner now, and they don’t use those."); that the project would make their jobs more difficult, because the boxes could attract drug users and result in loitering; and that the police department would receive more phone calls from community members complaining about people loitering in front of their homes or businesses. Most of the police officers were opposed to the red box project. Only one officer stated that the project was "a good idea."
Postintervention Focus Groups

Five months after the red boxes were placed in the community, focus groups were again held with 6 community members, 10 IDUs, and 8 police officers. One IDU and two police officers who attended the postintervention focus groups had also attended preintervention focus groups. All postintervention focus group participants were aware of the project. There was more support for the project during the postintervention focus groups. Police officers reported using the boxes after confiscating needles from persons who were not subsequently taken into custody (i.e., red boxes were an alternative to submitting discarded needles to authorities, which would necessitate a written report); IDUs reported frequent use; and community members viewed the project as one form of community empowerment ("It is [an effort to] take the neighborhood back."). All groups reported seeing fewer needles on the street since the introduction of the red boxes. All groups supported project expansion ("We definitely need more boxes.").

Red Box Use

Counts of deposited needles began 12 days after project initiation. During the 10-month pilot program, 2971 needles were deposited (Table 1). No consistent patterns of use were observed by week or month during this period.

Two months after project initiation, the BCHD received a call reporting that one red box had been unbolted and left lying in the street. The vandalized box was rebolted to the sidewalk. No repeat episodes were reported or observed. To address further concerns that people might break into the boxes and take the needles, 20 new needles, marked with white evaluation stickers, were placed in each red box (counts in Table 1 do not include marked evaluation needles). All marked evaluation needles were present at the end of 5 weeks.

During the 10-month pilot project, the Eastern Police District reported no complaints of loitering or disturbances around the boxes, and the BCHD received only one call (mentioned previously). There were no observations or reports of children using the red boxes, and there were no reports of citizens injuring themselves from picking up needles to dispose of them in the red boxes. At the times of needle pickup by the BCHD, an average of four persons were standing near each box. Although the local post office had reported needles in U.S. mail collection boxes before red box initiation, there were no such reports during the first 10 months of Operation Red Box. One stamped letter was found and subsequently mailed in one red box during the pilot project.

HIV Antibody Prevalence Among Red Box Needles

Of 156 needle washes, 17 (10.9%) tested positive for HIV antibody. Positive needles originated from three of the four collection sites and on all five of the collection dates with which needles were sampled. The location that did not yield any seropositive needles reported only one testable (i.e., fully intact) needle.

Number and Distribution of Discarded Street Needles

Four needles were sighted before the opening the red boxes (i.e., two on red box blocks, two on control blocks), and eight needles were sighted after the opening of the red boxes (i.e., four on red box blocks, four on control blocks). There was no difference in the rate ratios (i.e., red box blocks versus control blocks) when preintervention and postintervention samples were compared (Table 2), and the overall rate ratio for red box blocks compared with control blocks was estimated as 0.83 (95% confidence interval, 0.27–2.60). Overall, no statistically significant measures of association were found for the distribution of discarded needles.

DISCUSSION

In 1996, the BCHD instituted Operation Red Box as a needle drop box pilot project, designed to provide safe community-based disposal of used needles by IDUs. In the first 10 months, 2971 needles were collected. Of the disposed needles tested, 10.9% were positive for HIV antibody, suggesting that the boxes were collecting infectious needles that would have been a potential source

<table>
<thead>
<tr>
<th>TABLE 1. Needles retrieved in the initial 10 months of Operation Red Box, Baltimore, Maryland, 1996–1997</th>
</tr>
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<tbody>
<tr>
<td>Month of pickup</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>1996</td>
</tr>
<tr>
<td>July</td>
</tr>
<tr>
<td>August</td>
</tr>
<tr>
<td>September</td>
</tr>
<tr>
<td>October</td>
</tr>
<tr>
<td>November</td>
</tr>
<tr>
<td>December</td>
</tr>
<tr>
<td>1997</td>
</tr>
<tr>
<td>January</td>
</tr>
<tr>
<td>February</td>
</tr>
<tr>
<td>March</td>
</tr>
<tr>
<td>April</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*First official needle count was on July 3, 1996.
of infection to the public had they been discarded in regular trash or on the street.

In assessing the magnitude of use in the EBMC, we considered the 1990 census tract population information, data from the Maryland State Drug Abuse Administration (9), and data from the ALIVE project, a Baltimore-based research study (10). From these sources, we used the following information: the population of the EBMC is 11,403 (1.5% of Baltimore’s total population), 5% of Baltimore’s total population are IDUs (knowing that the EBMC is an area of high drug use, we estimated that 7% of its 11,403 residents inject drugs); Baltimore injectors inject an average of once daily; and Baltimore injectors use one needle a median of three times. With this information we estimated that approximately 7980 used needles would be generated by IDUs in the EBMC during a given month. Without accounting for the uneven geographic distribution of the boxes, we estimate that, because the average number of needles collected in a given month was 297 (Table 1), the red box project collected 4% of all used needles generated by IDUs in the EBMC during the initial 10 months of project operation. If similar disposal sites had been available throughout Baltimore City (one box for every 25 city blocks) and if rates of needle disposal were similar to the rates observed during the red box pilot, an estimated 368,000 needles could have been collected monthly.

Because the estimate assumes that the number of disposed needles would not increase with time (i.e., that potential users’ awareness and acceptance of the project would not increase with program maturation), it is a conservative estimate. Although the disproportionately high concentration of boxes in the southeast corner of the EBMC did not offer equal access to all EBMC residents (another assumption of the estimated percentage of all needles collected), this estimate is still low. It does, however, reflect the experience of a newly introduced pilot project and is best considered a baseline from which to measure the impact of project expansion and the dissemination of information about the project. While issues of public health impact are under consideration, prudent operations would maintain Operation Red Box as one component of a more comprehensive disposal system, which currently includes the NEP and selected pharmacies willing to accept used needles. It should not be considered the only means of community-based needle disposal.

Studies are needed to address the public health impact of needle drop boxes. Using the red box experience as a starting point, we suggest that additional projects include the impact of increased numbers of drop boxes with greater coverage throughout the community; more thorough assessment of changes in discarded street needles (i.e., necessitating street surveys covering a larger number of blocks, with more repetitions over a longer period); surveys of discarded syringes in the areas where IDUs are reported to leave them, including areas that were excluded from this survey for reasons of surveyor safety (e.g., abandoned houses, playgrounds, empty lots, areas under stoops, through holes found in the sides of buildings, trash bins, gutter drains, sewers).

One concern voiced during preintervention focus groups was that the red boxes might attract additional drug users to the area or increase loitering by drug users. Postintervention focus group reports, observations by project staff and city employees, and phone logs at the BCHD did not support this concern.

Focus group interviews showed that people within the community, police officers in particular, expressed more support for the red box project after 6 months of operation than before project initiation. This support in part resulted from anecdotal evidence of fewer discarded

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**TABLE 2. Observed rates of discarded needles per 100 pieces of street garbage observed during four street surveys**

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Red Box</th>
<th>Control</th>
<th>Rate ratio (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention</td>
<td>Needle count</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Garbage count</td>
<td>168</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td>Rate (CI)</td>
<td>1.19 (0.30–4.76)</td>
<td>1.08 (0.27–4.30)</td>
</tr>
<tr>
<td>Postintervention</td>
<td>Needle count</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Garbage count</td>
<td>250</td>
<td>181</td>
</tr>
<tr>
<td></td>
<td>Rate (CI)</td>
<td>1.60 (0.60–4.26)</td>
<td>2.21 (0.83–5.89)</td>
</tr>
</tbody>
</table>

* Garbage consisted of needles (N) + drug vials (V) + whole glass bottles (B); rate = (N/N + V + B) × 100.

*χ² = 0.1200, p = 0.7291; CI, confidence interval.
needles in public places after the red boxes were placed in the community.

Although community members reported fewer discarded street needles after the introduction of the red boxes than before, the systematic street survey showed no significant change in discarded needles. This discrepancy between community reports and survey results can be partly explained by the fact that the survey did not include abandoned houses, empty lots, or other potential points of needle disposal. For purposes of surveyor safety, this survey was restricted to items that could be observed on sidewalks and alleys.

Several cities, counties, and states have launched community programs to increase safe needle disposal (T.S. Jones, Centers for Disease Control and Prevention, personal communication, June 1996). The DeSoto County, Florida, disposal program, on which Operation Red Box was based, was one such program initiated in response to the accidental needle stick of a young girl. This program maintained a broad-based operation, serving all users of needles (D. Toews, DeSoto County Health Department, personal communication, March 1997). Most disposal programs have provided literature and standard “sharps” containers to users of insulin. Programs in Toronto, Ontario (Toronto Department of Public Works and the Environment—Operations Section, needle/syringe collected through the GTNOTS campaign, June 30, 1992 [unpublished material]); Melbourne, Victoria (11); and Baltimore, Maryland, went beyond the distribution of sharps containers and were specifically designed to reach IDUs. All three programs reported active use of their needle disposal system.

This evaluation of Baltimore’s program represents the most systematic assessment of community-based needle disposal boxes. The results from this pilot elicited an enthusiastic response from the BCHD (P. Beilenson, Baltimore City Health Commissioner, personal communication, April 1997). The red box sites reported here are still in service, and the placement of new needle drop boxes is planned for 1998.

The experience with Operation Red Box indicates that a small-scale pilot project was accepted by the community and used for safe needle disposal. Larger-scale implementation of community-based needle drop boxes should be evaluated in Baltimore and in other communities with substantial numbers of IDUs. The initial success of Operation Red Box suggests that community-based needle drop boxes will be a key component of a comprehensive effort to increase safe needle disposal by IDUs and others (e.g., persons with diabetes who inject insulin) who use needles outside health care settings.

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