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Review

Return Rates for Needle Exchange Programs: A Common Criticism Answered

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Abstract

This study searched the available needle exchange program (NEP) literature for return rate data. A total of 26 articles were found. The overall worldwide return rate was 90%, although this ranged from a low of 15% to a high of 112%. U.S. NEP return rates were gathered from only eight studies, indicating a clear need for more data, although U.S. return rates were comparable to those from NEPs outside of the U.S.

One underlying assumption made by opponents of NEPs is that IDUs will not return needles to the distribution site, thereby potentially increasing the risk of health problems to the surrounding community from exposure to contaminated needles. This study's results suggest that NEPs are relatively successful in taking in used needles, although it is generally unclear where the needles were originally acquired, and if IDUs return their own needles, or are returning needles for a social network. Ways for AIDS Service Organizations to capitalize on these brief encounters with IDUs, as well as public policy implications of the findings, are discussed.

Introduction

Sharing needles, for reasons of economy or social relations, has become the single most common mode of HIV transmission among injection drug users (IDUs). In turn, IDUs often spread HIV to other, non-injecting populations through sexual relations [1]. The public health ramifications of such sharing behaviors have long been recognized. Discarded, used syringes and needles are a potential biohazard throughout the geographic area within which IDUs primarily reside, and beyond it as well. As needle exchange programs (NEPs) increased in number throughout the United States and around the world, public health concerns also grew.

NEP opponents argue that providing IDUs with needles at little or no cost serves to increase the number of contaminated needles in a community, potentially increasing the risk of HIV and other blood-borne diseases for sanitation workers and the community at large, particularly children innocently playing at parks or beaches. Macalino et al. [2] point to conflicting syringe disposal laws and regulations at various levels of government as compounding the problem of creating safe, uniform avenues for used needle disposal.

The impetus for the creation and maintenance of NEPs emerged from the philosophy of harm reduction, an approach that assumes the probability of contracting or

spreading HIV/AIDS is minimized by providing IDUs with clean needles at little or no cost. The establishment and maintenance of NEPs reduce the risk of spreading HIV/AIDS between IDUs as well as to their sexual partners. Both establishing and maintaining NEPs can lead to substantial economic benefit to society via cost savings in long-term health care for uninsured/underinsured HIV+ individuals (see, for example, Holtgrave et al. [3]). According to Lurie and Drucker [4], if the U.S. government had embraced harm reduction and implemented a national needle exchange program from 1987 through 1995, a conservative estimate of between 4,394 and 9,666 HIV infections could have been prevented.

To date, surprisingly few studies have examined the impact of NEPs on discarded needles in a given area. Doherty et al. [5] studied a new NEP's effect on the number of "dirty" needles found in nearby neighborhoods in Baltimore, Maryland during its first two months of operation, and found no significant increase in the number of discarded needles on the streets. In a follow-up study two years later [6], the researchers determined that the number of discarded needles found in the neighborhood diminished in relation to the number of drug vials and bottles found, while the overall number of discarded needles had not increased.

From their inception, NEPs have been the focus of a wide variety of research studies for at least three reasons. First, as stated by Des Jarlais [7], any technique that has as its goal the reduction of harm must, by definition, place a high priority on seeking evidence to substantiate that reduction. Second, the political/legal controversy surrounding NEPs has created a circumstance in which data on NEP effectiveness has been a necessity. And third, for purely pragmatic reasons, NEPs were required to substantiate their effectiveness if they wished to receive initial or continued financial support from governmental entities, public health agencies, private foundations, or even philanthropists.

While the history of NEPs is relatively short in terms of years, the number of research studies on NEP effectiveness is substantial. Given the controversial nature of NEPs, the research itself, and what it says about NEP effectiveness, has become the subject of considerable debate. In a meta-analysis of the societal impact of NEPs, Ksobiech [8] compiled data from 79 NEP studies that contained change/comparison data (i.e., measured NEP attender behavior over time, or compared NEP attenders with non-attenders on a series of dependent variables). The overwhelming majority of studies report desirable societal outcomes (e.g., a decline in needle sharing by NEP attenders), with relatively few reporting negative effects [9-12].

Indeed, while the causal link has not been definitively made, participation in NEPs has also been associated with a decline in risky needle sharing/borrowing/lending behaviors [13], as well as a lower rate of HIV infection among IDUs and the surrounding population [14,15].

Circulation theory

Partially in response to the logical leaps associated with drawing IDU behavioral inferences from descriptive studies, as well as the methodological limitations of IDU surveys, Kaplan and Heimer [16] have developed and tested Circulation Theory. According to their formulation, in a true needle exchange, the number of needles distributed should be balanced by the number of needles returned, offering IDUs the opportunity to introduce new needles (and replace old needles) more rapidly. Facilitating the turnaround of needles reduces needle circulation time, and thus limits the time that needles are available for multiple uses. In short, the probability of contracting HIV via a "dirty" needle should be reduced. Abdala, Stephens, Griffith, and Heimer [17] supported this theory in a study that sought to determine the duration of survival of HIV-1 in syringes utilized by IDUs.

Via a series of mathematical formulae and models (not discussed here), Kaplan, Heimer, and colleagues sought to test their theory, primarily with data from the New Haven NEP. By following the distribution and return of sequentially labeled syringes, they determined the length of time a given syringe was "in circulation" as well as tested that syringe, upon its return, for the presence of HIV proviral DNA. Results of these investigations [18-23] are promising.

Return rate studies

Given the need to present at least descriptive statistics regarding NEP activities, some NEP researchers have recorded the number of needles distributed and returned during a particular period of time, typically annually. Return rate data may provide useful evidence of NEP effectiveness in reducing needle-sharing behaviors among NEP attenders, without relying on IDU self-reports [24]. Robles et al. [25] opine that the number of syringes exchanged can be used as an outcome measure of NEP effectiveness. The logic is simple: the higher the return rate, the less time dirty needles are in circulation, the greater the likelihood that IDUs are using clean needles more often, and the lower the probability that IDUs in the NEP population share injection equipment.

Critics of this evaluative approach point out that there are problems with inferences drawn from return rates. The fact that a needle was returned, even within a relatively short period of time, does not provide any information about its history while in the possession of an IDU [26],

unless the syringe undergoes a laboratory analysis upon its return. Advocates assert that funding limitations and legal restrictions have often constrained NEPs in their hours of operation, variety of locations, and the number of needles that can be exchanged at any one time. Consequently, it has been difficult to educate IDUs and develop a consistent pattern of NEP utilization, thereby limiting the potential impact of NEPs as indexed by return rate [27].

Purpose of study

Despite the scientific evidence that links NEP attendance with desirable societal outcomes, there continues to be controversy surrounding the establishment and maintenance of NEPs, particularly in the United States. Because injection drug use is generally viewed as an undesirable activity, "helping" IDUs to more safely inject drugs is, for many, a complex ethical/legal/moral issue, particularly when supporting NEPs is equated with supporting drug use.

One particular criticism, often articulated by NEP opponents, is a concern that providing needles does nothing more than increase the *supply* of needles, potentially creating a health hazard for the public at large, while allowing IDUs to continue their habit at the expense of someone else (the funding source for a given NEP). This argument's underlying premise is that IDUs simply will not return needles provided by NEPs. If used needles are not returned, and are instead discarded in unsafe ways, the risk to the non-IDU population, via infected needles, increases within the community. One approach, then, to assessing NEP effectiveness is to assess the balance between needles distributed and returned to NEPs. The present study sought to examine available NEP return rate data to establish a reasonable baseline NEP return rate and answer this question: Is the number of needles distributed from NEPs proportionate to the number of needles returned to NEPs?

Methodology

NEP research studies were gathered as part of larger study not reported here. The search techniques employed to locate pertinent articles included: (1) computerized databases; (2) hand searches of key journals; (3) reviews of references listed in scholarly works; and (4) attempts to contact via e-mail researchers whose work was not published and/or available through conventional means.

A variety of computerized databases were searched, using "needle exchange" and "syringe exchange" as key words (considered interchangeable terms, although it is recognized that there are distinctions between them), to locate potential quantitative studies dealing with NEP efficacy. They were: AIDSLINE; MEDLINE; PSYCINFO; ABC POL SCI/GOVT; ALT-HEALTH WATCH; CINAHL; HEALTH SOURCE PLUS; SOCIAL SCIENCES INDEX; SOCIOLOGICAL ABSTRACTS; WEB OF SCIENCE; CONFERENCE PAPERS INDEX; and DISSERTATION ABSTRACTS ONLINE. The intent was to consider all studies conducted worldwide in this area published in English. Cumulatively, the databases yielded more than 5,000 references. In addition, on-line resources such as Project SERO and the Centers for Disease Control were thoroughly examined to determine if any studies had been overlooked.

From that list, studies that were clearly unrelated to this study's purpose were eliminated (e.g., the publication was not an academic source, such as *AIDS Weekly Plus*, or, abstract information indicated that the published work was an editorial, letter, or less than one page long). Many such articles were available on-line, and were scanned before being eliminated.

Hand searches of key journals (e.g., *AIDS*) were conducted, and reference lists of published articles were reviewed in an attempt to gather additional NEP return rate data. Overall, however, database searches yielded the bulk of the return rate data.

Abstracts of conference papers were also obtained, and an attempt was made to contact authors via e-mail correspondence. This approach was largely unsuccessful. Most authors had either changed jobs or e-mail addresses since the time of the conference paper.

In the end, the search process yielded 26 studies that reported information on the number of needles distributed as well as the number of needles returned to a given NEP over varying periods of time. Those studies were the basis for the results reported in the following section.

Results

The overall return rate for NEPs included in this analysis was 90%, based upon a total distribution of 11,971,584 needles ("needles out"), and 10,793,270 needles returned to the NEPs ("needles in"). Four investigations [24,25,28,29] employed some sort of needle tracking system in order to determine length of time a needle was in circulation and/or to test a sample of the needles returned for the presence of HIV. Table 1 presents a complete listing of the studies providing return rate data.

Return rates varied from an atypical low of 15% in Sicily [30], based on a very small number of needles, to a high of 112% in the United Kingdom, in a study involving more than 600,000 needles [31]. In addition to Nigro et al. [30], three other studies [25,28,32] reported NEP return rates below 50%. Together with the Gruer et al.

Table 1: Summary Table of Studies Reporting Return Rates.

Author	Country	Needles Distributed	Needles Returned	Return Rate
Alcabes et al. [28]	Poland/Soviet Union	1,576	670	43%
Barsdley et al. [40]	Canada	77,089	61,430	80%
Doherty et al. [5]	United States	70,574	68,376	97%
Donoghoe [41]	United Kingdom	52,535	42,864	82%
Grob [35]	Switzerland	10,244,369	9,219,932	90%
Gruer et al. [31]	United Kingdom	633,100	715,220	112%
Grund et al. [42]	The Netherlands	57,328	46,610	81%
Guydish et al. [24]	United States	4,239	2,593	61%
Hart et al. [43]	United Kingdom	107,400	82,931	77%
Hay & McKeganey [44]	Scotland	138,982	116,954	84%
Heimer et al. [36]	United States	80,300	56,210	70%
Honti & Ban [45]	Hungary	8,142	6,466	79%
Jacob & Stover [46]	Germany	21,150	20,907	99%
Kaplan et al. [29]	United States	30,429	30,429	100%
Keene & Stimson [47]	United Kingdom	78,813	63,228	80%
Ljunberg et al. [48]	Sweden	5,348	3,665	69%
Nigro et al. [30]	Sicily	376	56	15%
O'Keefe et al. [49]	United States	10,108	9,499	94%
Oliver* [33]	United States	100,000	102,000	102%
Paone et al. [50]	United States	20,083	13,646	68%
Quan et al. [51]	Vietnam	21,495	17,433	81%
Robles et al. [25]	Puerto Rico	146,323	58,529	40%
Sergeyev et al. [34]	Russia	31,020	31,764	102%
Stimson et al. [52]	United Kingdom	24,290	19,106	78%
Vlahov et al. [27]	United States	209	144	69%
Wolk et al. [32]	Australia	6,306	2,608	41%
Overall Results		**11,971,584**	**10,793,270**	**90%**

*Based upon an estimation provided by the author, rather than raw numbers.

study [31], Kaplan et al. [29], Oliver [33], and Sergeyev et al. [34] reported return rates of 100% or more.

The Grob [35] study, conducted in Switzerland, was clearly the largest in terms of number of needles involved, reporting a return rate of 90% for the more than 10,000,000 needles distributed. Eliminating that study as a potential "outlier" from the analysis results in an increase in the worldwide return rate to 92% (1,646,915 needles distributed, 1,517,128 needles returned).

There was, somewhat surprisingly, no difference between return rates in the United States and countries throughout the rest of the world. However, only eight U.S. studies measured needles distributed and returned, and the overall return rate was 90% (315,942 needles distributed, 282,897 needles returned). There were relatively few total needles involved in the U.S. data, and three studies [5,33,36] accounted for almost 80% of the total number of needles distributed. The remaining 18 studies provided return rate data from NEPs operating outside of the U.S.; likewise, these NEPs had a 90% overall return rate (11,655,642 needles distributed, 10,510,373 needles returned).

Based upon this review of 26 studies, the research question posed must be answered in the affirmative. In most cases, for every ten needles distributed, nine needles were returned, although not necessarily the same needles (discussed below). Thus, needles are consistently being returned to NEPs.

Discussion

The evidence regarding return rates presented here makes it clear that supplying IDUs with clean needles does not lead to more "dirty" needles in any given community. While NEP critics argued that distribution of needles to IDUs does nothing more than increase the number of needles in circulation, the evidence presented here does not support that assertion. An overall return rate of 90% suggests that there is a relative balance between NEP needles distributed, and the number of needles returned to NEPs.

As indicated earlier, four studies included in the preceding analyses had return rates below 50%, with each research

team offering a different explanation. Alcabes et al. [28] collected return rate data shortly after the local clinics in Poland and the former Soviet Union began distributing needles, and conjectured that the low return rate overall (43%) could be related to the very limited harm reduction activities going on in that part of the world at that time. Nigro et al. [30] reported a mere 15% return rate during the six-month pilot NEP program in Sicily, but also stated that the return rate improved over the course of their study, while admittedly involving relatively few clients and needles. The Robles et al. study in Puerto Rico [25] hypothesized that the 40% return rate may mean that the clean needles received at the NEP were sold, discarded after use outside of the NEP, and/or were given away, perhaps related to the availability of syringes via pharmacies, or due to fears of lack of anonymity resulting from the use of marked needles. Wolk et al. [32] stated that their 41% return rate might be related to the proximity of their data gathering to the legalization of syringe possession, so that IDUs may still have been reluctant to return used syringes for fear of arrest.

The remaining 22 studies included here had return rates over 60%. NEPs worldwide appear to be successful in getting approximately the same number of needles returned as are distributed, and so the existence of NEPs do not logically pose a health hazard to the general population. The data also suggest that U.S. NEP return rates are comparable to international return rates, despite the fact that NEPs in the U.S. have been, and continue to be, mired in controversy.

After reviewing the literature, it is clear that more data is needed on NEP attendance patterns. After personally observing a mobile NEP in the Midwest several times over the past few years, it was readily apparent that one person exchanged needles for one or more people, which is allowed at this particular NEP. Thus, merely quantifying "needles returned" to NEPs might not be an appropriate index of those actually *using* NEPs. At the observed NEP, one IDU brought in 300 used syringes (a not-uncommon occurrence, as this particular NEP did not have a set limit on the number of needles an IDU could exchange), and was given a similar number of clean needles. NEP staff suggested that the IDU was likely exchanging needles for a drug house.

The latest available NASEN (North American Syringe Exchange Network)-sponsored survey of NEP directors lends credence to this point [37]. When asked what percent of exchanges did they estimate were secondary exchanges (syringes being exchanged for use by someone else), the 109 NEP directors responding estimated that somewhere between 10 and 39 percent of their NEP participants were actually reached via secondary exchange. The NEP exchanger, then, could be considered the link in a drug using social network in order to attract the rest of the network into appropriate HIV risk interventions and/or services.

Suggestions for future research

While return rate studies gathering information on needles going in and out of various NEPs are useful, there are clearly a number of additional studies which need to be done to (a) provide a more complete picture of the exchange process, and (b) utilize the process itself to intervene indirectly in the lives of other IDUs.

Additional demographic information

While collecting and analyzing return rate data is good, additional demographic information on the IDUs involved in exchanging needles would be better. How many are male or female? What is the race/ethnicity of NEP attenders? Their age? How does the number of needles picked up and/or returned *relate* to any of these demographics? Of course, anonymity would need to be preserved so that the NEP could continue its harm reduction work.

For example, while NEP demographic data reported in published studies does not usually extend to an analysis of risky IDU behaviors, it may be the case that females are less likely to attend NEPs and actively exchange, although they could well be using NEP needles given to them by a drug or sexual partner. If that is so, reaching more female IDUs, a particularly difficult population, might require creating interventions that reach female IDUs through their male NEP-attending partners. To date, the author is not aware of any such research. There is a clear need for investigations of this sort, particularly given that female IDUs also frequently engage in commercial sex work, thereby potentially infecting people outside of their primary relationship and drug using networks.

Improved tracking of non-returned needles

As stated, the number of needles returned to NEP is relatively proportionate to those distributed. However, it is unclear from the literature what happens to those needles not returned. Critics would argue that those needles are disposed of in an unsafe manner, the so-called "trash" that may harm the public at large. There are, of course, other options for IDUs beyond throwing used works into trash bins or on the streets. Given that most communities have "drop boxes" of some sort, or sharps containers ultimately turned in for biohazard disposal, it could well be the case that many NEP-provided needles are responsibly disposed of at the time of use, if possible, unless an IDU feels the need to quickly get the needle out of his/her possession. In short, more research is needed in this area, so that evidence can be provided as to where those needles

not returned to NEPs end up. It is at least possible that NEP attenders are altogether more conscientious about disposing of their needles than are non-attenders.

NEP staff as an untapped source of information and intervention

During informal "ride-along" observations, the author was struck by the wealth of untapped knowledge that NEP staff, in this case mobile van drivers, appeared to have about their NEP clients. The staff often knew the drug history of NEP attenders, current living circumstance, general health condition, and readiness to engage in drug treatment. In addition to the information they could provide to researchers, these frontline NEP staff need better training in on-site interventions, as well as in recruiting IDUs into off-site interventions.

Possibilities for networking with other IDUs

If a single IDU exchanges needles for a drug house or multiple IDUs, it might be possible to reach additional IDUs by providing the NEP client with information to pass along, skills training to assist him/her in working with others, or even condoms to distribute. Such an approach could be an extension of the Popular Opinion Leader model suggested by Kelly and his colleagues [38,39]. Further, the drug house NEP attender could be recruited to bring other IDUs in their drug using network to the exchange site for testing, counseling, and ultimately drug treatment.

Summary of study

The purpose of this research study was to locate NEP studies that included needle return rate data in their results, and develop a baseline for comparison of new and existing NEPs. A total of 26 return rate studies were found. The results indicate, overall, NEPs typically achieve a return rate of about 90%. However, it is less clear if IDUs are returning needles for others, or even if the needles being returned necessarily originated at the same NEP, since most researchers did not track their needles. Concern over the increased availability of contaminated needles in NEP communities appears to be unwarranted. The fact that many IDUs return needles to NEP sites offers an intervention opportunity for NEP staff.

Competing interests

None declared.

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