Invited Commentary: Needle Exchange—No Help for Hepatitis?

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In 1993, Heimer, Kaplan, and associates (1) showed a reduction in the proportion of human immunodeficiency virus (HIV)-infected syringes among those returned to the New Haven, Connecticut, needle exchange in the months following the opening of the program. This reduction suggested a decrease in the circulation time of used needles among injectors who use the exchange, and this decrease can in turn be modeled as corresponding to a reduction in the HIV seroconversion rate of 25-30 percent. This is still the only real estimate of the actual effect of a needle exchange on HIV seroconversion in a US population.

The New Haven study was extremely influential in providing an intellectual underpinning to the rapidly expanding needle exchange movement, which began in the United States in the late 1980s. A second study providing support was Hagan and collaborators' case-control study of hepatitis in injectors in Tacoma, Washington State, which showed an apparent major reduction in clinical hepatitis attributable to exchange use (2). However, that study has now been directly contradicted by a new study, carried out by some of the same researchers, of hepatitis B and C seroconversion in Seattle, Washington, injectors, which is published in this issue (3). The new study by Hagan et al., a large cohort study, is the first prospective study of the effect of needle exchange on blood-borne infections in the United States; it shows no effect of needle exchange use on hepatitis B virus (HBV) and hepatitis C virus (HCV) seroconversion.

The study by Hagan et al. (3) comes on the heels of studies in Montreal and Vancouver, Canada (4, 5), which showed no effect of needle exchange use on seroconversion for HIV. (The HIV seroconversion rate in Seattle was too low to examine the effect of the needle exchange program.) These three direct studies of viral infections in exchange users, all negative, contrast with a series of statements from influential US expert groups and journal editors about the effects of needle exchange use in reducing infections associated with injection drug use. There are important reasons to argue for needle exchange in the United States, but we suggest the evidence needs a closer look.

The science has in fact been modest. The study by Heimer, Kaplan, and associates (1) and the Tacoma case-control study (2) described above were the primary studies with biologic outcomes cited in the successive reviews of the needle exchange strategy over the 1990s and both are suggestive rather than definitive. Otherwise, support for the needle exchanges rested on indirect studies, primarily on an ecologic study which compared HIV seroprevalence rates in cities with and without exchanges (6), and on studies whose endpoint was self-reported behavior change (7, 8). This raises the issue of what evidence is sufficient for an intervention such as needle exchange to become policy. Probably most epidemiologists would not have regarded the data assembled as sufficient evidence of effectiveness in a different field (say vaccine effectiveness).

Why the shortage of prospective research? The answer is politics. Because the needle exchange debate, as with all debates concerning drug use, is deeply polarized, little direct prospective research was carried out in the early years of needle exchange programs. National Institute on Drug Abuse (NIDA) grant-holders were explicitly prohibited from using Federal funds to investigate needle exchanges. There was a freezing effect among researchers and no well-designed studies were put in motion. Furthermore, it should be noted that the field is polarized on both sides; needle exchange and harm reduction have become embattled issues whose supporters often believe further systematic studies are not necessary to demonstrate the effectiveness of exchange use. The new study by Hagan et al. (3), which contradicts the earlier Tacoma case-control study (2), is an excellent demonstration of the pitfalls of this approach. (The original case-control study may, as the authors suggest, have suffered from a selection bias.)
So do needle exchanges work? There is probably no single answer to this question. In the United States, in terms of the effects on HIV, it is hard to tell. The original study by Heimer, Kaplan, et al. (1) provides part of the reason. An optimistic estimate of the effect of a needle exchange program might be a reduction of 30 percent or less in HIV seroconversion among exchanges. However, it is also true that exchanges attract higher-risk drug users (3–5, 9); thus, observed seroconversion in exchange users may be the same as, or even greater than, that in nonusers.

Another cautionary note comes from the original Amsterdam needle exchange, started in the middle 1980s to reduce hepatitis B infection in drug users. The initiators concluded that the effect of the Amsterdam needle exchange on HIV was probably small, and could not be distinguished from the overall effect of all the interventions aimed at HIV in drug users (10). Something similar is probably true in most US cities. Fairly extensive long-term interventions with drug users (counseling and testing, outreach, bleach, education) have reduced HIV seroconversion rates to the order of 1–2 percent per year in many cities, comparable with rates in gay men. In San Francisco, the rate was about 2 percent per year and falling in the late 1980s, before the opening of the needle exchange program (11). In Seattle, the rate reported in the current study is only 0.2 percent per year. Even in New York, recent research suggests seroconversion rates of about 1 percent per year in a broad variety of separate studies (12). Thus, something is indeed working, over time, in reducing HIV in US drug users. Probably, as in Amsterdam, what is working is everything. In this situation, any effect of a needle exchange will be difficult to detect. Needle exchanges should probably best be thought of as part of a broad, long-term approach to controlling HIV in drug users.

A third factor which makes it hard to evaluate needle exchanges is that they undoubtedly produce a major increase in the overall availability of needles in a community through secondary exchange mechanisms. This is a good thing insofar as it spreads the intervention widely, but it makes it difficult to detect the effects in exchange users. In San Francisco, a high proportion of young injectors use clean needles available through secondary exchange chains (J. Hahn, unpublished data). This diffusion phenomenon makes it hard to detect an effect of needle exchange, but is probably part of the reason for the low HIV seroconversion rates in much of the United States. The secondary exchange mechanism is controversial because it involves the distribution of large numbers of needles to individual exchangers, but it probably serves to make clean equipment available to otherwise hard-to-reach groups such as younger users.

Thus, in the US situation, the effects of needle exchanges on HIV are probably modest, long-term, and hard to detect, but overall HIV seroconversion rates are low. In the Canadian studies, on the other hand, needle exchange appears to have failed in what amounts to two outbreak situations. (The HIV seroconversion rate reported in Vancouver was 18.6 percent per year (4).) Where there is an explosive HIV seroconversion outbreak, providing clean needles does not necessarily seem to produce a short-term solution, presumably because availability alone is not the primary determinant of needle sharing. Although US seroconversion rates are generally lower, as noted, the Canadian studies are sobering and are a reminder to watch for potential outbreak situations in young injectors in the United States, e.g., as a result of the introduction of cocaine injection into this population.

What about hepatitis B and C? In the United States, given the low HIV seroconversion rates, the lifetime morbidity and mortality risks associated with hepatitis infections, particularly HCV, may now be greater than those associated with HIV. The new study by Hagan et al. (3) is sobering because it shows, in a cohort with little HIV seroconversion, no effect of needle exchange on HBV and HCV infection. In fact, it shows seroconversion rates of 9.1 percent per year for HBV and 18.6 percent per year for HCV, rates comparable with those in the pre-exchange era (13). Thus, the distribution of sterile equipment, together with the other ongoing interventions in Seattle, does not appear to have reduced hepatitis risk. Why not?

It may be that the amount of syringe sharing that continues is under-reported, and that given the high prevalence and infectiousness of HBV and HCV, there is enough sharing to spread these viruses but not HIV. Alternatively, it may be, as Hagan et al. suggest, that injectors do not share syringes but continue to share dissolved drug doses, cottons, and cookers. Contamination of shared doses and shared equipment does not appear to allow HIV to be transmitted in Seattle, but may be sufficient for HBV and HCV transmission. These are open questions and they set an important agenda for research. Needle exchange programs should recognize the phenomenon and consider making hepatitis intervention part of their regular program. They should raise awareness about splitting drug doses and sharing equipment other than syringes, and should publicize the hepatitis infection rates in drug users. They should also consider ways of using the exchanges to facilitate HBV vaccination, perhaps using short vaccination schedules appropriate to mobile populations (14). Given the history of the needle exchange controversy, they might want to approach these questions in an experimental format.
The Seattle study, in identifying this high risk of HBV and HCV infection and a possible approach to intervention, suggests that an empirical approach to needle exchanges pays off in the end. Among the issues on the research agenda are 1) why Canadian seroconversion rates in injection drug users are so high, 2) whether it is paraphernalia sharing that transmits HBV and HCV, and what can be done about it, and 3) what are the effects of the secondary exchange mechanisms. The debate about approaches to drug use in the United States is highly politicized in the current era. The Drug Czar, General Barry McCaffrey, recently observed, in language reminiscent of the McCarthy era, that there was a "carefully camouflaged, exorbitantly funded, well-heeled elitist group whose ultimate goal is to legalize drug use in the United States" (15). This is the attitude that made serious prospective studies of needle exchanges impossible in the early 1990s. Although it is sometimes hard for those involved in the issue to respond without getting equally carried away, the way to meet it is in fact with good research and interventions that work.

REFERENCES