

The Impact of Needle Exchange–based Health Services on Emergency Department Use

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OBJECTIVE: To examine the impact of the New Haven Community Health Care Van (CHCV), a mobile needle exchange–based health care delivery system, in reducing emergency department (ED) use among out-of-treatment injection drug users (IDUs) between January 1, 1996 and December 31, 1998.

DESIGN: A pre-post comparison of ED utilization was performed using linked medical records from New Haven's only two emergency departments. Fixed-effect negative binomial regression analysis was used to explore the impact of the CHCV on ED use within a longitudinal cohort.

SETTING: Mobile health clinic in New Haven, Conn.

PARTICIPANTS: Out-of-treatment IDUs.

INTERVENTION: Acute care, linkages to medical, drug treatment, and social services.

MEASUREMENTS AND MAIN RESULTS: Among 373 IDUs, 117 (31%) were CHCV clients, and 256 had not used CHCV services. At baseline, CHCV users were more frequent users of ED services ($P < .001$). After full-scale implementation, mean ED utilization declined among CHCV clients and increased within the non-CHCV group. CHCV use is associated with statistically significant reductions in ED use, with an incidence rate ratio (IRR) of 0.79 (95% confidence interval [95% CI], 0.66 to 0.95). Subgroup analyses demonstrated significant IRR reductions, notably among Hispanics (0.65; 95% CI, 0.47 to 0.90), men (0.79; 95% CI, 0.64 to 0.98), HIV-negative IDUs (0.79; 95% CI, 0.63 to 0.98), and those with mental illness (0.75; 95% CI, 0.60 to 0.94).

CONCLUSION: Needle exchange–based health care services can reduce ED utilization among high-risk injection drug users. Such services may have an important role within communities with high rates of drug use and HIV/AIDS.

KEY WORDS: injection drug users; substance abuse; emergency room; health care utilization; needle exchange; HIV/AIDS; mobile health care; cost of care.

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The ability of needle exchange programs (NEPs) to reduce HIV incidence among injection drug users (IDUs) is acknowledged by researchers and by many policy

makers.^{1–3} The possibility afforded by these services to improve other aspects of patient well-being and social performance receives less systematic attention, but may be equally important.^{4,5} NEPs provide a mechanism to reach a unique population at high risk for many infectious diseases, psychiatric disorders, accidental and intentional injury, homelessness, and extreme poverty. NEPs are also well placed to confront flaws in existing health care delivery systems that prevent drug users from obtaining appropriate and timely services.

High rates of emergency department (ED) use by IDUs are important by-products of both adverse health status and barriers to primary care within this patient population. Recent analyses by McGeary and French⁶ and French et al.⁷ document that illicit drug use is an important risk factor for ED use, and is associated with increased expenditure.

From an economic standpoint, inappropriate or medically avoidable ED utilization has been linked with cost-ineffective care.^{8,9} Although the direct charges for ED services are often modest, frequent ED visits can be markers for other, more intense and costly service needs.^{10–12} No less important, frequent ED use may indicate that an individual is experiencing preventable acute illness, insufficient medical management of chronic illness, or lack of access to appropriate care.^{10,13–16} For all of these reasons, a growing literature describes efforts to reduce ED utilization by populations prone to heavy use.^{9,17–21}

IDUs have increased age-matched morbidity and mortality for many acute and chronic medical conditions.²² Moreover, they often rely on episodic care in emergency departments or require expensive hospitalization when they present with advanced disease states.²³ This analysis explores the impact of the Community Health Care Van (CHCV), a needle exchange–based primary health care intervention in New Haven, Connecticut that delivers health care proximate to sites of out-of-treatment drug users. We hypothesized that on the basis of the extent and array of services provided, CHCV utilization would be associated with reduced rates of emergency department use.

METHODS

Study Site

This study was conducted in New Haven, Connecticut, a mid-sized city (population 130,000) with an estimated population of 1,900 to 2,600 active drug injectors.²⁴ New Haven, like other urban northeastern cities, has a high prevalence of poverty, homelessness, drug abuse, and HIV/AIDS. HIV prevalence among tested returned syringes

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decreased from more than 67% to 43% after implementation of the New Haven Needle Exchange.²⁵ New Haven is also one of 15 U.S. cities in which AIDS has been the leading cause of death among women aged 25 to 44.⁸

Study Subjects

In the Spring and Summer of 1997, a sample of 373 out-of-treatment injection drug users was recruited using respondent-driven sampling²⁶ as part of an ongoing longitudinal study of IDUs (Project CHEER [Community, Health Education, Evaluation and Research]). The aim of this study is to understand the health care utilization, risk behaviors, and experiences with the health care system of out-of-treatment IDUs.

Each participant, after satisfying standardized measures of active drug injection, was administered a standardized questionnaire to assess demographic characteristics, social circumstances, drug use, sexual behavior, health services utilization, and psychological well-being. Individual-level data were then linked to emergency department data from New Haven's only two hospitals, Yale-New Haven Hospital and the Hospital of St. Raphael.

Informed consent was provided by all respondents to access all medical, drug treatment, prison, and social service records during the course of the study and for the previous year. Overall methodology and mechanisms to protect confidential patient data were approved by the Yale University School of Medicine's institutional review board.

Intervention Design

The current CHCV, which travels in tandem with the New Haven NEP, is a 36-foot mobile health care unit that is designed to provide acute care and linkages to available community medical treatment, drug treatment, and social services. Services are organized to address the particular needs of IDUs and other medically marginalized individuals in neighborhoods with high prevalence of injection drug use.

The CHCV serves 4 locations that provide broad coverage of neighborhoods with high concentrations of injection drug use. The timing and location of CHCV services largely reflected the schedule of the New Haven NEP, because the needle exchange included an important population of out-of-treatment IDUs requiring medical and social services. Although CHCV schedules slightly varied over time to reflect NEP scheduling changes and other logistical concerns, CHCV operated on a fixed schedule that allowed predictable service delivery to program clients and facilitated follow-up where needed.

The CHCV, the first mobile health program linked to needle exchange, grew out of a collaboration between local health care providers from the community and university settings in 1992. A survey of NEP clients identified unmet needs for several key services: convenient acute and preventive services, referral and linkage to drug treatment

and other services, and on-site HIV counseling and testing; and led to the initial array of services provided by the CHCV.²⁷

The CHCV program began with the original 18-foot van in January 1993, operating 1 day per week. Services—including acute medical care, HIV counseling and testing, and social work referrals—expanded to 2 days per week in 1994. The current van, with 2 exam rooms and 1 counseling room, began operation in the summer of 1996, reaching full capacity by September 1 of that year. In addition to medical and HIV services, a case manager, a drug treatment coordinator, and an outreach worker were added to the program. Services were then expanded to 3 1/2 days per week; currently, the CHCV operates 5 days per week.

In the course of full-scale implementation, the CHCV expanded its clinical care to include diagnosis and treatment of tuberculosis and sexually transmitted infections. A widespread vaccination program for influenza, tetanus, and pneumococcal infections was also added. Staff also offer general health education/counseling, and distribute condoms. Patients, regardless of drug use status, may be seen for any medical, drug treatment, or social service need. Clinical care and donated medication are available to uninsured clients free of charge for medically indicated reasons. All clients are offered appropriate referral to existing community medical and social services.²⁸

CHCV clients include a broad range of extremely disadvantaged individuals. Seventy percent of CHCV clients are unemployed; 35% are current or recent injection drug users. IDUs who obtained CHCV services faced especially high medical and social risks. Twenty-seven percent reported a history of commercial sex work; 26% had been in jail or prison during the 6 months prior to CHCV service use. IDUs seeking services exhibited a mean of 2.9 medical encounters with CHCV staff over the survey period.

IDUs within the CHEER cohort exhibited a similarly high prevalence of many chronic conditions and infectious diseases. One hundred fourteen members of the CHEER cohort reported testing positive for HIV. Ninety-eight respondents had received medical care during the previous year for psychiatric disorders. One hundred two had received care during the previous year for an infectious disease, while 148 had received care for chronic illness.

Unlike many interventions in the emergency medicine literature, the CHCV is not designed or specifically intended to reduce ED use. Personnel do not counsel patients about inappropriate ED care. Reduced ED use is not a featured goal of program operations. We know of no case in which emergency department staff or other providers counseled patients to use the CHCV rather than to seek ED services. In fact, CHCV staff actively refer (or directly transport) patients to the ED for services that cannot be provided on site. Many of these individuals would not have presented to the ED were it not for their clinical interaction with CHCV staff. At no time were clinical staff discouraged from making ED referrals. Staff were not

instructed in any way to discourage ED use. Some CHCV staff suggest that CHCV referrals to the ED were particularly common prior to full-scale implementation, when CHCV staff had more limited capacity to care for minor emergent conditions.

Staff do, however, provide many services considered by emergency departments to be inappropriate use of an ED. These services include intensive case management and referrals to drug treatment, minor wound care, prescription refills, and treatment for routine primary care problems, such as management of chronic asthma and hypertension. Staff members also schedule and coordinate follow-up appointments at existing local clinical sites of care.

Outcome Measures

The central outcome measure of interest in this study is the number and the timing of recorded patient encounters with an ED in the 3-year period between January 1, 1996 and December 31, 1998. The period between January and September 1996 is the pre-intervention phase and serves as baseline ED use. September 1, 1996, when the CHCV program became fully operational, is the beginning of the intervention phase for comparison of ED use between those who used the CHCV and those who did not.

A pre-post comparison was therefore performed, in which ED visits during the pre-intervention phase were compared with visits during the subsequent 27 months (intervention phase). For sensitivity analysis, the pre-post analysis was conducted using earlier and later cutoffs to define the intervention. The use of later cutoffs (any point to January 1, 1997) produced similar point estimates of program effects. The use of cutoffs prior to July 1, 1996 produces smaller point estimates with larger point estimates given the short time interval of pre-intervention data. Changes in ED use are compared between respondents who had used the CHCV and those who had not. Our statistical model is used to estimate the proportional impact of CHCV use on rates of ED use.

Statistical Analysis

ED utilization is a rare, episodic event influenced by many personal characteristics, preferences, and circumstances that are unobservable by clinicians and researchers. Because patients in areas with ready access to CHCV self-select into services, CHCV use may be correlated with unobserved characteristics that are also linked with ED use.

To minimize the impact of such unobserved heterogeneity, we use a fixed-effect Poisson arrival rate model. This approach presumes that each individual has unobserved characteristics, attitudes, and circumstances likely to influence ED use. Such models have been found appropriate for ED use and for other analyses involving medical encounters.^{19,29} Experience in other applications indicates that the variance in ED visits across individuals may be quite high when compared with the mean number of visits in the same sample. We allow for the possibility of

such “overdispersion” using a negative binomial specification. These specifications were programmed within the STATA software package (Version 6.0; Stata Corp., College Station, Tex).

The estimated coefficients from the negative binomial regression model are then converted to incidence rate ratios (IRRs) associated with CHCV use. An IRR of less than 1.0 indicates that CHCV use reduced the estimated rate of emergency department use.

This fixed-effect specification effectively provides a pre-post comparison of ED arrival rates. The CHCV use is estimated to reduce ED usage if CHCV patients showed larger pre-post declines in ED utilization than was observed in the non-CHCV group. Because individuals are used as their “own controls,” this specification also facilitates subgroup analysis on populations of special clinical or policy significance.

RESULTS

Figure 1 demonstrates CHCV monthly patient visit patterns. Patient encounters more than doubled after full implementation of the CHCV. (The sharp transient drop during late 1997 reflected turnover in 2 key positions). Full-scale implementation substantially increased the volume and accessibility of patient services.

Table 1 displays demographic and selected baseline characteristics of the study participants. Of the 373 out-of-treatment IDUs, 117 (31%) could be identified with patient identification numbers within the CHCV clinical database. The remaining 256 had no documented CHCV use.

CHCV patients make more frequent ED visits, are more likely to use the NEP, and are less likely to be white. However, the 2 groups appear quite similar in their sociodemographic characteristics, observed health status, and drug-using behaviors.

Table 2 describes overall ED use within the 3-year study period. As shown, CHCV users made fewer visits, but more visits per person, than the did non-CHCV users.

Figure 2 displays ED utilization rates for CHCV respondents and for non-CHCV users within the CHEER

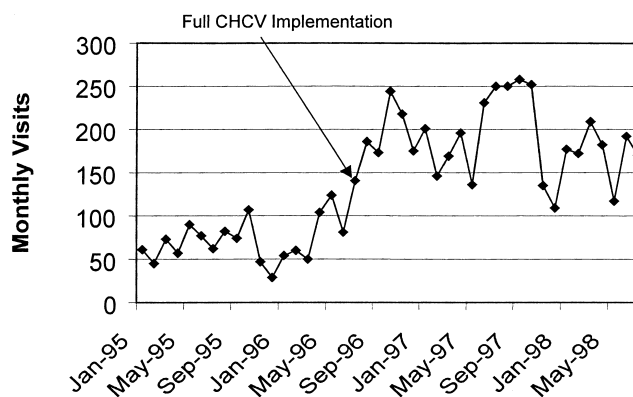


FIGURE 1. Monthly CHCV service use.

Table 1. Comparison of CHCV and Non-CHCV Users Among Out-of-Treatment Injection Drug Users

Variable	CHCV Users (n = 117)	Non-CHCV Users (n = 256)
Demographics		
African American*, n (%)	55 (47)	85 (33)
Hispanic, n (%)	25 (21)	34 (13)
White†, n (%)	37 (32)	128 (50)
Male, n (%)	82 (70)	159 (62)
Has health insurance, n (%)	90 (77)	173 (68)
Mean age, y	39.80	40.05
Health status		
Self-reported HIV-positive (348 valid responses), n (%)	39 (35)	75 (32)
Self-reported previous diagnosed mental condition, n (%)	54 (47)	111 (44)
Self-reported previous diagnosed depression, n (%)	49 (42)	104 (41)
Self-reported previous post-traumatic stress disorder*, n (%)	5 (4)	29 (11)
Self-reported previous suicide attempt, n (%)	11 (9)	27 (11)
Self-reported chronic medical condition, n (%)	83 (71)	174 (69)
Mean 1996/98 ED visits‡, n	1.96	1.25
At least 1 ED visit in 1996, 1997, or 1998‡, n (%)	70 (59)	116 (46)
Self-reported previous bacterial infection, n (%)	61 (52)	124 (48)
Drug use status		
NEP is primary source of sterile needles†, n (%)	71 (61)	95 (37)
Self-reported crack use in past 30 d, n (%)	57 (49)	121 (47)
Self-reported previously diagnosed alcoholism, n (%)	13 (11)	36 (14)
Self-reported prison incarceration in prior 6 mo, n (%)	30 (26)	47 (18)

* P < .05.

† P < .001.

‡ P < .01.

Group differences tested with Fisher Exact Test. CHCV, Community Health Care Van; ED, emergency department.

cohort. The top line shows ED utilization per patient-year among CHCV patients. The bottom line corresponds to study participants who did not use CHCV services. All graphs are reported in units of visits per patient-year. Because ED use is relatively infrequent, we smooth the graphs using a 3-month moving average to highlight changes in utilization between the two groups.

Over the full study period, CHCV users made more frequent ED visits. Pre-implementation disparities in usage were especially marked. However, ED use by CHCV patients peaked in February 1996, and then averaged more than 1 visit per person-year during the spring and early summer of 1996. ED use markedly slowed during the late summer of 1996, coinciding with full CHCV implementation. As shown, the nonuser group exhibited increasing ED use over 1996 and 1997, with slightly decreased use after the first quarter of 1998.

Table 3 shows incidence rate ratio associated with the CHCV. The first row of estimates indicates the estimated program effect for the full CHEER cohort. As shown, the CHCV was associated with a statistically significant IRR below 1.0, indicating a reduction in the rate of ED use. Reductions were especially pronounced at the dominant local provider, Yale-New Haven Hospital Emergency Department, over the study period.

Below are the comparable estimates, estimated for specific subgroups of specific clinical and policy interest. Reductions in overall ED use were large and statistically significant ($P < .05$) for 5 of the 10 examined subgroups.

Hispanic/Latinos indicated the most substantial reduction in ED use. Reduction in ED use at Yale-New-Haven were especially large and statistically significant for most of the subgroups examined.

Insurance status appeared to be a small factor in patients' decisions to seek ED care. Among CHEER respondents who had recently used ED services, only 3 percent cited lack of coverage as a factor in the use of such care. Another 16 percent reported that they frequented the ED because other providers were closed when they needed assistance. In contrast, 66 percent of

Table 2. 1996–98 Emergency Department Utilization Among CHCV Users and CHCV Non-Users Among CHEER Respondents

Number of ED Visits	CHCV Users (n = 117), n (%)	Non-CHCV Users (n = 256), n (%)
0	47 (40)	140 (55)
1	20 (17)	49 (19)
2	17 (15)	18 (7)
3	16 (14)	23 (9)
4	4 (3)	6 (2)
5–9	9 (9)	17 (7)
10+	4 (4)	3 (1)
Total visits	229	319
Visits/person-year	0.65	0.415

CHCV, Community Health Care Van; CHEER, Community, Health Education, Evaluation and Research; ED, emergency department.

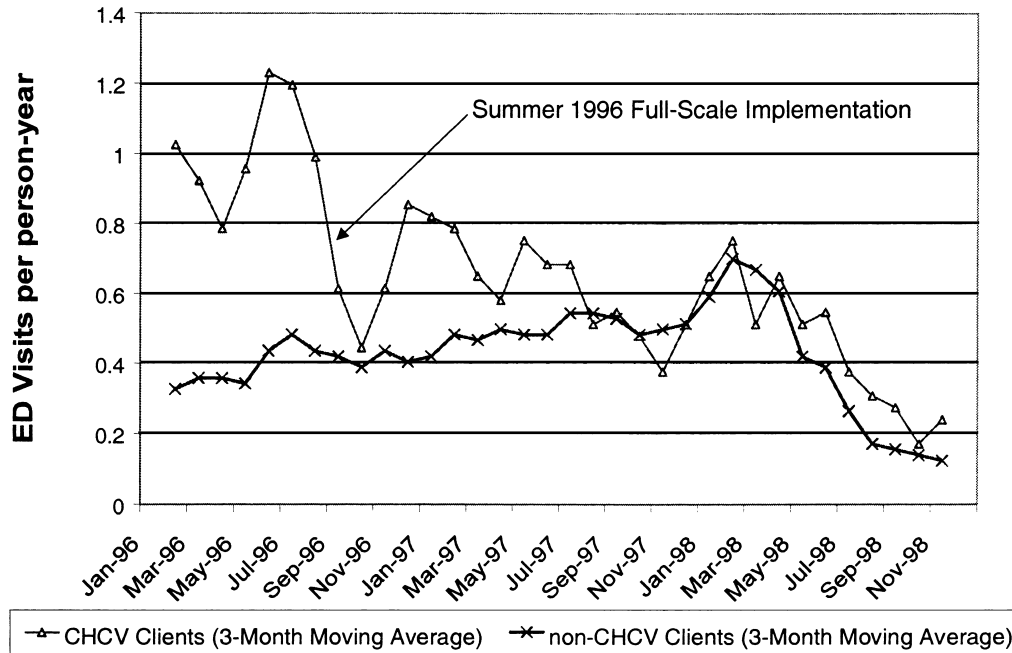


FIGURE 2. The CHCV and emergency department use.

patients, reported that they used the ED because they were extremely sick or injured and believed that they needed emergency care.

DISCUSSION AND CONCLUSIONS

This study demonstrates that full-scale implementation of the New Haven Community Health Care Van was associated with a more than 20% decline in emergency department visits. Most of this reduction was concentrated at Yale-New Haven Hospital, the city’s largest provider of

emergency medical services. Reductions appeared broadly distributed among the examined subgroups, although changes were especially noted among Hispanics, HIV-negative IDUs, men, and those with coexisting mental illness.

Reductions in ED use were especially striking because the CHCV was not specifically designed or intended to achieve this result. Reduced ED utilization appears to have resulted indirectly from other CHCV efforts to improve patients’ health status and to employ case management and outreach to improve continuity of care. Lack of

Table 3. CHCV-related Reduction in ED Use for Full-sample and Selected Subgroups 1996–1998

	Incidence Rate Ratio in Total ED Use (95% CI)	Incidence Rate Ratio for YNHH ED (95% CI)
Full sample, n = 373	0.79* (0.66 to 0.95)	0.57† (0.46 to 0.70)
Subgroup analysis		
Non-Hispanic White, n = 165	0.71‡ (0.48 to 1.04)	0.57† (0.35 to 0.93)
African American, n = 140	0.94 (0.72 to 1.2)	0.55† (0.40 to 0.75)
Hispanic, n = 59	0.65§ (0.47 to 0.90)	0.54† (0.38 to 0.77)
Male, n = 241	0.79* (0.64 to 0.98)	0.65† (0.50 to 0.85)
Women, n = 132	0.80 (0.57 to 1.11)	0.39† (0.26 to 0.59)
Self-reported HIV-positive, n = 114	0.80 (0.60 to 1.10)	0.65* (0.45 to 0.92)
HIV-negative or unknown, n = 259	0.79* (0.63 to 0.98)	0.53† (0.40 to 0.69)
Health insured, n = 263	0.79* (0.65 to 0.97)	0.54† (0.43 to 0.69)
Uninsured, n = 92	0.80 (0.53 to 1.19)	0.68 (0.42 to 1.1)
Self-reported mental illness, n = 165	0.75* (0.60 to 0.94)	0.54† (0.42 to 0.71)
No self-reported mental health problems, n = 205	0.88 (0.64 to 1.20)	0.61§ (0.42 to 0.88)

* P < .05.

† P < .001.

‡ P < .10.

§ P < .01.

ED, emergency department; YNHH, Yale-New Haven Hospital.

follow-up and case management have been identified as risk factors for repeat ED visits and for medically avoidable use.^{10,13,18,30}

Several variables one might have thought to be important proved unrelated to estimated program effects. Point estimates did not notably differ (in magnitude or statistical significance) by self-reported HIV status. Although HIV-infected individuals have more complex medical needs that might require emergency care, they also have access to specialized medical and social services that may reduce the need for emergency care.⁸ HIV-infected individuals within our cohort were also more likely to have health insurance and fewer barriers to receiving care in community care settings.

The benefits of the CHCV in reducing ED use appeared surprisingly unrelated to health insurance. According to additional survey responses of the CHEER cohort, nearly three quarters reported some form of insurance coverage, generally Medicaid or other public sources. Point estimates for insured and uninsured respondents were quite similar. Other responses also indicate that insurance was a small factor in patients' decisions to seek ED care.

Because the CHCV operates cooperatively with the New Haven Needle Exchange Program, it is accessible and convenient for many injection drug users who use related services. All CHCV services are provided without charge, eliminating financial barriers to health care use. Because the CHCV does not pursue public or private reimbursement for specific services, these services may also avoid other administrative barriers that block service use. For example, patients need not provide personal identification or documentation to verify insurance coverage. This may remove an important access barrier for undocumented immigrants and for other individuals engaged in illegal or covert behaviors. In keeping with the harm reduction message delivered by the NEP, CHCV staff members seek to provide medical services in a nonjudgmental and supportive manner that may also prove attractive to injection drug users.

STUDY LIMITATIONS

This study has several important limitations that should be considered in evaluating the present findings. The most important internal validity concern stems from patient self-selection into CHCV care. In their reliance upon street-based health services, CHCV clients may have different demand for health services than is found among other New Haven IDUs. CHCV clients may also have morbidities associated with increased ED use. Indeed at baseline, CHCV clients displayed higher ED use than was found among other CHEER cohort members. Some CHCV staff suggest that baseline disparities in ED use reflect the CHCV policy to refer or transport emergent patients to the ED.

CHCV clients may have also been a somewhat sicker group. Prior to full-scale CHCV implementation, CHCV

clients averaged 0.27 ED visits per year requiring hospital inpatient admission, compared with an average of 0.127 such visits among non-CHCV clients in the CHEER cohort ($\chi^2_2 = 14.6$; $P < .001$).

Our recruitment of a comparison group of non-CHCV clients allows us to scrutinize some of these concerns. Our fixed-effect methodology avoids bias from fixed patient characteristics that are correlated with both ED and CHCV use. However, if CHCV patients were more likely than other respondents to have experienced transient conditions that occasioned ED use early in the study period, our pre-post design might overstate the impact of the CHCV. We cannot rule out this possibility, but we know of no indication of such patterns within our CHCV patient population.

Because the intervention was not specifically designed to prevent ED use, we do not know which components of the CHCV were most effective in reducing ED use. We also do not know the nature or medical appropriateness of the marginal ED visits that were apparently prevented by the CHCV intervention.

As with most studies of individuals engaged in covert behavior, our recruited cohort of IDUs is a self-selected sample from a larger, hidden population.³¹ Although the number of active drug users is not known, existing data suggest that the CHEER cohort may include 20% of New Haven's active drug injectors.²⁴ Under stringent assumed conditions, our chain-referral sampling technique will produce a representative sample of the full population.²⁶ If these assumptions fail, treatment effects within the CHEER cohort may not represent the likely impact of services for the full population of New Haven IDUs. The pre-post design is designed to minimize resulting biases. As in any study of hidden populations, it is difficult to evaluate the magnitude of these concerns.

Crossover effects may also influence our estimates of CHCV treatment effects. Within the comparison group of 256 men and women with no documented CHCV use, 31 respondents reported some use of CHCV services. These respondents may have used CHCV to receive free condoms or other low-level services that do not require explicit medical encounters. Patients may also have received more extensive services under an alias or may have refused to provide identifying information for data linkages. To scrutinize the latter possibility, study staff compared self-reported ED use to hospital ED records data from the 2 care sites. We found no discernable evidence of resulting bias.

The most serious threat to generalizability flows from the unusual nature of the CHCV and the local environment in which the intervention was conducted. The administrative, clinical, and political environment of the CHCV implementation may be more favorable than those in other communities. Such concerns have proved important for many experimental or best-practice interventions that proved difficult to broadly replicate in such areas as prenatal care or preschool education.³²

Although the CHCV is a primary care intervention with modest unit costs, it is affiliated with a large teaching hospital with extensive resources for substance abuse treatment and HIV/AIDS care. Many CHCV patients already have ongoing contact with the city's two major hospitals. CHCV-affiliated investigators include the director of Yale-New Haven's Nathan Smith HIV Clinic and other researchers with direct responsibilities for AIDS clinical care. The city of New Haven also offers a favorable environment for the development of CHCV services. The city's needle exchange is implemented with close cooperation from social service and law enforcement agencies. Further, Yale-New Haven Hospital and the Hospital of St. Raphael have implemented other van-based interventions in such areas as mammography and prenatal care.³³

Despite these unique features of New Haven, many cities provide syringe exchange or otherwise provide a supportive environment for clinical interventions to serve IDUs. Although program implementation must be matched to specific settings, we believe that mobile health clinics are promising in diverse contexts to serve severely disadvantaged individuals.

COMMENT

Because IDUs practice illegal and often harmful behaviors, citizens and policy makers might presume that interventions to serve this population are ineffective. Yet well-implemented prevention and health services have been shown to be effective and cost-effective in many settings. The current study indicates that primary health care services can reduce ED use—an important outcome for both policy makers and clinicians.

These very findings illustrate important shortcomings in existing systems of care. Street-based primary care would be less necessary if discrete high-risk populations received appropriate and comprehensive care in traditional settings. Many IDUs are released prisoners, often on probation or parole.³⁴ Others are recently relapsed after spells in residential or outpatient drug treatment. Others are dually diagnosed with severe mental illness and require specialized care. Increased access to traditional health services, appropriate discharge planning, case management, and other services would lessen the need for street-based stopgap services for men and women who lack proper access to medical care. This study suggests that until such services are more fully developed, needle exchange-linked primary health care services can significantly reduce IDUs reliance on cost-ineffective and less desirable emergency department care.

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