HIV Prevention Interventions for Injection Drug Users: A Review of the Literature from 1998 to the Present

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Introduction

The purpose of this literature review is to provide a document to inform decisions as to appropriate HIV intervention materials and messages for injecting drug users (IDUs). These decisions will affect and influence interventions for IDU implemented by contractors of the Colorado Department of Public Health and Environment (CDPHE) for the years 2003 - 2005.

The specific question which guides this review, is what, if any, innovative approaches to HIV prevention with IDUs are being used and evaluated by intervention programs in the United States and Canada that could be transferred to Colorado (This, due to statutory restriction, excludes syringe exchange). The issue of drug treatment, both as a venue for intervention and as an HIV prevention intervention modality is of importance as regards this research question. In addition, Hepatitis C (HCV) has become, in the past few years, a very real and recognized health threat to IDUs globally, nationally and locally. In Colorado, studies conducted by CDPHE in the late 1990's among IDUs participating in HIV preventions in the Denver Metro area found an HCV positive rate of around 80%. This review then also includes information regarding Hepatitis C including recommendations for prevention efforts and efficacy of specific HIV prevention materials in HCV control. Additionally, articles dealing with HCV usually included some discussion of young injectors and new initiates into injection drug use. Finally, a small portion of articles dealing with other health related harms are also here presented. Among these health concerns are endocarditis, "cotton fever," abscess, and overdose.

Methods

The search engine MEDLINE/PubMed (National Library of Medicine; Bethesda, MD; USA) was accessed via internet. The MEDLINE/PubMed service produces citations for articles meeting search criteria, including authors and, where available, article abstracts. Keywords used to generate the literature search were HIV prevention, Hepatitis C prevention, bleaching, abscess, endocarditis, and overdose, with a constant mediator keyword of injecting drug use. Two criteria were used; first, articles older than 1998 were excluded, and second, articles referencing interventions or populations other than those in The United States and Canada were excluded.

The literature search produced a total of 98 citations with abstracts that met the above criteria. These were then divided between those articles that dealt with interventions, Hepatitis C, and other health issues of IDU specifically or that dealt in a more general way with injection drug use, epidemiology, treatment and HIV risk. This produced a total of 52 citations and abstracts which met the search criteria. The Denison Memorial Library (University of Colorado Health Sciences Center; Denver, CO; USA) was then utilized to locate and copy the full articles of these 52 citations. Four articles could not be located. Finally, 48 articles were used to produce the bulk of the information in this review.

HIV Interventions for IDU

Since 1998 only one meta-analysis and two reviews of HIV intervention programs for IDU have been published. A review by Coyle et al, summarized findings from thirty-six studies of outreach-based HIV risk reduction interventions for out-of-treatment injection drug users(1). Thirty five of the thirty six studies were funded by the National Institute on

Drug Abuse through cooperative agreements released in 1992 and 1995. The interventions in these thirty five cases were variants of a single quasi-experimental design. The intervention design included HIV testing, individual level risk reduction counseling delivered in single or triple sessions. The meta-analysis found dramatic behaviour change in almost every category of HIV risk. Given the length of the interventions, in some instances less than an hour, and the limited contact between participants and intervention personnel, these findings vary greatly from other articles in this review.

A meta-analysis conducted by Prendergast et al, summarized and evaluated data collected from peer reviewed articles that in turn evaluated 18 HIV prevention programs in drug treatment programs(2). Among the findings that the researchers discuss are that HIV prevention programs with greater intensity produced greater risk reduction. Intensity defined as the likelihood that the intervention would cause a psychological change or an emotional reaction. Further that the length of the intervention (in all cases group level) was less important than the manner in which the interventions were presented. Separate gender sessions were associated with improved outcome for sexual behaviour measures. Peer group discussion/counseling was associated with higher effect for overall outcomes and for sexual behaviour outcomes. Interventions that used six or more types of techniques (didactic lecture, condom use demonstration, skills building, audiovisual presentation, etc.), were associated with better outcomes than interventions that used five or fewer techniques. While these studies were specific to drug treatment programs at least some of the findings are applicable to IDU out of treatment.

A review by Gibson et al of the effectiveness of psychosocial interventions evaluated published data from 19 different intervention programs (3). This study found no difference in effectiveness of individual, group and community level interventions. It also reported substantial to dramatic behaviour change among study participants. The authors concluded that more intense and sustained interventions had a demonstrably greater impact on behaviour. Participants in more successful interventions appeared to be a more stable and motivated subgroup of users, whereas participants in less successful interventions were a heterogeneous mix of users at different stages of change. The authors also noted that those programs that implemented brief assessments for participants had a significantly greater effect on behaviour than those programs that had no assessment. While they posit some reasons for this, in general that adduce that assessment of a persons current practice regarding sexual and injection behaviours may cause behaviour change regardless of any further intervention.

A number of articles looked at specific issues and concerns as regards program implementation. In their multi-site study Cunningham-Williams et al, reported on strategies to enroll and retain IDUs in HIV prevention efforts(4). The authors found that across the three sites (St Louis, MO; San Antonio, TX; and Durham and Wake Counties, NC) there was an overrepresentation of nonwhite participants. They recommend that outreach processes be modified to adequately reach white users, including social network tracking, utilization of peer referrals and opening outreach centers during evening hours and on weekends.

One article dealt with motivations towards behaviour change. Hawkins et al specifically looked at social modeling and other etiological factors associated with the

decrease of risk behaviour (5). The authors studied the differential effect of social modeling behaviour versus verbal encouragement among peers. The authors found that among the highest risk IDUs those who reported observing more peer protective behaviour were also more likely to report lower frequencies of HIV risk behaviour (used needle sharing) and increased frequency of HIV protective behaviour (cleaning needles prior to use). In contrast, peer verbalization of norms about cleaning was not associated with either lower frequencies of HIV risk behaviour or increased frequencies of HIV protective behaviour. In fact, "encouragement by peers to engage in cleaning needles," was found to be associated with decreased frequency of unclean needle sharing. These authors conclude that," social modeling (subject's perception of peer behaviour in HIV related protective behaviour) was more influential than receiving verbal persuasion to engage in HIV related protective behaviour. These finding support Bandura's contention that social modeling of behaviour is a stronger predictor than verbal persuasion and supports the old adage that actions speak louder than words."

In an article addressing theory-based interventions, McMahon et al evaluated the effectiveness of a cognitive-behavioural HIV risk reduction intervention versus a standard care intervention in a residential treatment setting (6). The researchers found that while participants in both modalities had a high level of HIV awareness prior to intervention that HIV-related anxiety was only moderate to average. Further that unprotected sex increased at post-intervention follow-up. The authors state that while substantial reductions in injection drug use occurred that there were few meaningful or enduring changes in HIV risk related knowledge, beliefs, attitudes or expectancies. They

finally conclude that there was little superiority of the cognitive behavioural intervention in comparison with a standard care intervention.

One article dealt specifically with issues as they impact female injection drug users (7). Brown interviewed 140 female IDUs attending methadone maintenance clinics in New York City. The author found that self-efficacy and social support were strong predictors for condom use with a primary partner. Brown also found AIDS risk perception low in spite of reported risk related behaviours for drug use and sex. Brown recommends that education, skills-building, and incorporating social networks into interventions be used to increase self-efficacy among female IDUs.

Two studies examined the efficacy of drug treatment as regards HIV intervention. Hoffman et al studied outcomes from some 8,000 drug users in 22 sites in the United States (8). Their findings indicate that entry into drug treatment corresponded to reductions in involvement in drug injection-related risk behaviours. They also found that a large proportion of drug users who received treatment continued to have fairly high levels of drug use and continued to place themselves at risk for contracting HIV via frequency of drug injection. In a study of cost-effectiveness of methadone maintenance programs, Zaric et al concluded that this treatment modality not only had substantial impact on slowing the spread of HIV but also that access to methadone should be greatly expanded(9).

One study examined the effect of psychiatric comorbidity on the efficacy of HIV prevention programs (10). Compton et al studied the association between two psychiatric disorders, anti-social personality disorder (ASPD) and depression, with HIV prevention interventions among cocaine users. The authors found that cocaine users with ASPD

decreased significantly nearly all their high risk behaviours. They also found among this subgroup that sex related risk was decreased as well, though less significantly. Among those persons with depression no statistically significant trend was found towards decreasing HIV risk behaviour. In the small subgroup of those with depression, however, risk behaviour decreased more than in the total sample of eligible non-comorbid cocaine users.

Finally two articles examined the use of social networks in recruitment and message diffusion in HIV prevention interventions. Broadhead et al compared outcomes from a traditional outreach program and a peer driven intervention [see Figure 1] (11). the peer driven program participants were encouraged and provided incentives for bringing new members into the intervention. Intervention materials and media were placed through these peers into the community. The recruitment schema [see Figure 2] for the peer driven intervention shows how the social networks interact and also the points of convergence that were used by peers to "hop" from one social network web to another. The authors concluded that the peer driven intervention outperformed the traditional outreach model on a wide variety of diverse variables. The effects on HIV risk reduction of both interventions were significant with the peer driven intervention achieving slightly increased levels. As regards cost effectiveness, a newly recruited participant in the traditional outreach model cost on average $470 while a peer recruited participant on average required $16. In the study the authors noted an interesting geographic effect where peer networks further removed from the storefront outreach site and the main "hub" of social networks showed less behaviour change than those more proximate to the intervention.

Neaigus studied social networks among discordant couples, the majority of whom were IDUs (12). In a comparison with individual level interventions the author found that participants in network interventions were more likely to reduce drug risks and in some cases sexual risks, than were participants in individual level interventions. Neaigus concluded that network interventions reached more IDUs and may be more cost-effective that individual level interventions.

Hepatitis C

Hepatitis C virus (HCV), identified in 1988, is a positive-strand RNA virus classified as a separate genus in the family Flaviviridae. Within an infected individual, HCV consists of a population of closely related but heterogeneous sequences, called quasispecies that result from rapid mutation. The genetic diversity of HCV appears to prevent the development of an effective neutralizing immune response, thereby establishing high rates of chronic infection and complicating vaccine development.

The incubation period for acute hepatitis C averages 6 to 7 weeks. During the acute phase of HCV infection clinical disease is apparent in only 25% to 30% of infected persons, and death from fulminant hepatitis C is rare. Persistent infection with HCV develops in at least 85% and chronic hepatitis in 70% of HCV-infected persons. Chronic HCV infection is associated with progression to cirrhosis and primary hepatocellular carcinoma.

Injection drug users have the highest HCV infection rates of any sub-population studied. HCV infection is acquired after initiation of injection more rapidly than other viral infections. Garfein et al found that 50% to 80% of injectors test positive for anti-

HCV within 6 to 12 months after initiating injection (13). Similar results have been obtained by researchers in Denver. In an overview of HCV by Alter and Moyer, they recommend implementing an array of prevention efforts to slow the spread of the disease among injection drug users (14). These tactics include," programs to prevent initiation of drug injection and encourage injection drug users to seek treatment, stop using, or modify their injection practices and to practice safe sex should include messages about risk and prevention of viral hepatitis, including the use of hepatitis B vaccine and HIV."

Heimer et al examined HIV and HCV knowledge among IDUs in Chicago IL, Hartford CT and Oakland CA (15). The authors first note that," little attention has been paid to preventing the transmission of hepatitis among IDUs. This is most evident from the fact that even though there is a safe effective vaccine to prevent hepatitis B infection, there has been no mandate for a comprehensive program to vaccinate IDUs." Among the conclusions in the article is that participation in HIV prevention programs, including syringe exchange programs, was not associated with increased hepatitis knowledge. The authors recommend that HIV prevention programs actively screen participants for HCV and HBV and vaccinate susceptible IDUs against HBV. Finally, they note that increased hepatitis knowledge was associated with decreased hepatitis risk behaviours, and that HIV programs must include information and education regarding hepatitis risk.

A number of papers on HCV have dealt with age and infection. Murrill et al in a study conducted among persons entering drug treatment in six cities (Baltimore, MD; Denver, CO; Detroit, MI; Newark, NJ; San Francisco, CA; and Seattle, WA) found that anti-HCV prevalence increased with age (16). The authors concluded that longer duration injection drug use may lead to more sharing of injection equipment including syringes. It

is also interesting to note that of the six cities studied Denver had the second highest rate of anti-HCV positivity, 92% (only Baltimore was higher with 93%). The authors recommend intervening with younger IDUs and persons who have recently initiated injection drug use.

One of the most important questions that HCV prevention raises vis-à-vis HIV prevention is whether bleach inactivates the hepatitis C virus. Thus far in HIV prevention, bleach disinfection of used injection equipment has been considered the "standard of care." It is now known that heating also inactivates HIV, as when drug solutions are prepared and heated in a cooker (17). Abdala et al have re-asked the question as to whether bleach inactivates HIV (18). In their study, the researchers attempted to replicate as closely as possible conditions IDUs encounter when they disinfect syringes. The authors concluded that one rinse with full strength bleach or three rinses with water were equivalent in substantially reducing, but not eliminating the likelihood of a syringe being potentially infectious with HIV. They also raise the issue of HCV and HBV and conjecture that these viral agents may be more resistant to disinfection than HIV.

Alternatively, a study by Monterroso et al of 2,306 IDUs recruited in five cities found the opposite result (19). At one year follow-up, they found that," Cleaning used needles was not protective in any analysis and, in fact, was correlated with a paradoxically increased risk for HIV infection…those who try to protect themselves from HIV by cleaning a previously used needle may not be doing so consistently, effectively, or both."

Does bleaching inactivate HCV? Kapadia et al conducted a nested case-control study comparing 78 HCV seroconverters with 390 persistently anti-HCV seronegative injection drug users (20). Using logistical regression they found that injectors who reported using bleach all the time or some of the time were less likely to seroconvert than those who reported no bleaching. The authors also raise the issue of young injectors and new initiates into injection drug use, "conventional programs such as syringe exchange and drug treatment programs may have less impact on HCV incidence because younger injection drug users, those more likely to seroconvert, are less likely than older users to seek services from such agencies."

Again and alternatively, Hagan et al in a study of 53 HCV seroconverters among a baseline cohort of 317 IDUs (21) found that the seroconverters and non-seroconverters reported consistent rates of bleaching used syringes. The conclusion being that bleaching offered little or no protective effect from HCV infection risk.

Young Injectors, New Initiates and Hepatitis C

The issue of younger injectors is raised repeatedly in the literature as regards HCV infection. Garfein et al studied the prevalence and incidence of HCV infection among 229 persons who had been injecting less than two years (22). Among the findings of this study were an association between HCV infection and the circumstances of initiation into injection drug use. Specifically the authors found that first injecting with a person at least five years older was associated with a greater likelihood of being infected with HCV than injecting with peers closer in age. The authors recommend that," community-based prevention programs should also target medium to long-duration IDUs to prevent

experienced IDUs from sharing injection equipment with new injectors." Miller et al, in a study of young IDUs in Vancouver found similarly that HCV seroconversion was associated with requiring help to inject in the previous six months (23).

Other factors have been associated with initiation of injection drug use and HCV infection. Fuller et al found among a cohort of 226 injectors aged 15 - 30 years that exclusive crack smoking was associated with initiation of injection drug use (24). This finding augments that of Thorpe et al (25) who found that heavy crack smoking was associated with increased likelihood of HCV infection.

By way of putting the issue of youth injectors into perspective, a study conducted by Lifson et al of homeless youth in Minneapolis found that of a convenience sample of 201, 16% reported ever having injected drugs(26). In addition they found that 6% reported having injected drugs in the previous month. Of the young people who reported ever having injected drugs all reported having shared syringes at some time. While difficult to generalize from the sample, these findings clearly indicate one aspect of the problem of new initiates into injection drug use and younger injectors.

Other Harms

As early as 1968 attending physicians in emergency rooms and community clinics had begun to recognize that injection drug users were subject to an array of illnesses not commonly found in the general population (27). Among these are infective endocarditis, "cotton fever", abscess, cellulitis and overdose. A brief review of some of the more recent articles regarding these harms follows. In general these articles make no

recommendations regarding prevention but rather provide a perspective on the morbidity and mortality associated with these ailments, and injection drug use.

Endocarditis is an inflammation due to bacterial infection in the endocardium, the tissue that lines the surface of the heart muscle. In injection drug users the most common form of endocarditis is tricuspid valve endocarditis, however, infections of the valves on the left side of the heart also occur and are becoming more frequent (28).

Studies of endocarditis and outcome from treatment are infrequent in the literature. One article reviewed 80 cases of injection drug users admitted to a Scandinavian hospital for staphylococcal septicemia with or without endocarditis during the years 1965 - 1980(29). Of the 80, 36 were diagnosed with endocarditis and endocarditis was suspected in another 18 cases. The outcome was lethal in five patients, one with tricuspid endocarditis, two with left-sided endocarditis, one with retrosternal abscess and one with septicemia. Unfavourable outcome was associated with patient's delay, severe underlying disease and/or lack of cooperation. By 1983, 12 more of the patients who comprised this sample had died, two from endocarditis and one from pneumonia.

Binswanger et al studied abscess and cellulitis among 169 IDUs recruited in San Francisco CA in 1997(30). The authors, using an interview instrument, and an examination by a nurse practicioner or physician to verify abscess or cellulitis found that intra-muscular injection (skin-popping or muscling) was associated with higher likelihood of infection. Of the recruited IDUs nearly a third (n = 40) had abscesses or cellulitis. A significant number of those with presenting abscess or cellulitis had attempted medical self-treatment, including self-lancing (32%) and the use of street-

purchased anti-biotics (16%). The use of alcohol prep pads was also not associated with any protective effect. The authors recommend that the use of antibiotic ointments after injection may be a better method of preventing infection. Finally, each successive decade of IDU experience was associated with a step-wise reduction for the risk of abscess or cellulitis.

In extreme cases, injection drug use can lead to far more serious infections than abscess and cellulitis; these include wound botulism and tetanus (31, 32).

"Cotton fever" has been recognized by the medical community as associated with injection drug use since 1975 when Thompson described a syndrome of fever and leukocytosis (an increase of white blood cells) in the absence of apparent bacterial infection in 11 of 69 febrile injection drug users (33). He concluded that cotton fibers from the filtering of the drug solution might be the etiological agent and coined (or perhaps borrowed) the term "cotton fever". A 1990 article documents a case of "cotton fever," with a literature review of the subject by Harrison and Walls (34). The authors conclude that "cotton fever" is a benign febrile self-limited syndrome that may mimic sepsis in IDUs. They recommend short-term observation as an alternative to hospital admission for febrile drug users with a presumptive diagnosis of trivial illness and in those in whom the diagnosis of "cotton fever" is entertained.

Ferguson et al, reported on a case of cotton fever where the bacteria *Enterobacter agglomerans* was cultured both from the patient's blood and from the cotton he had used to filter heroin (35). The authors note that cotton and cotton plants are heavily colonized with *Enterobacter agglomerans*. They conclude that *E agglomerans* was most likely the

causal agent of the cotton fever and recommend antibiotic therapy. They also suggest that patients presenting with cotton fever should have cultures performed.

Heroin related emergency department visits increased 99% between 1988 and 1995, with overdose accounting for a third of these events (36). A study by Ochoa et al of overdose among young injectors in San Francisco CA found that of a sample of 124 injectors that a full 48% had experienced at least one overdose (37). The median age of the sample was 22 and the median number of years injecting was 4. Overdose was associated with speedball injection, with borrowing or lending syringes, with heroin injection and with gay or bisexual activity. The findings suggest that those persons at highest risk of overdose are also those injectors at highest risk of HIV infection. Seventy nine percent of reported overdoses were in persons reporting gay or bisexual activity or borrowing needles or both. The recommendations of the authors are important and are quoted here at length, “Given the dramatic increase in overdose mortality, we suggest that awareness of the overdose problem must be raised among drug users and their providers, and that developing effective interventions should become a priority. In particular, obstacles to seeking emergency services should be defined and addressed. Since fear of arrest is one potential barrier, fatal overdoses could be prevented through protocol changes in the emergency response system, thereby limiting police involvement during an overdose. Teaching injectors to use 911 and training them in cardiopulmonary resuscitation (CPR) are potential interventions to reduce the number of fatal overdoses. Providing the opiate antagonist naloxone for administration to drug partners in case of overdose is an area in need of study."

Citations

1. Coyle SL, Needle RH, Normand J. Outreach-based HIV prevention for injecting drug users: a review of published outcome data. Public Health Rep 1998 June;113 Suppl 1: 19 - 30.

2. Prendergast ML, Urada D, Podus D. Meta-analysis of risk-reduction interventions within drug abuse treatment programs. J Consult Clin Psychol 2001 June; 69(3):389 - 405.

3. Gibson DR, McCusker J, Chesney M. Effectiveness of psychosocial interventions in preventing HIV risk behaviour in injecting drug users. AIDS 1998 May 28; 12(8):919 - 929.

4. Cunningham-Williams RM, Cottler LB, Compton WM, et al. Reaching and enrolling drug users for HIV prevention: a multi-site analysis. Drug and Alcohol Depend 1999 (54): 1 - 10.

5. Hawkins WE, Latkin C, Mandel W, Oziemkowska M. Do actions speak louder than words? Perceived peer influences on needle sharing and cleaning in a sample of injection drug users. AIDS Educ Prev 1999 Apr; 11(2):122-131.

6. McMahon RC, Malow RM, Jennings TE, Gomex CJ. Effects of a cognitive-behavioural intervention among HIV negative male substance abusers in a VA residential treatment. AIDS Educ Prev 2001 Feb; 13(1):91 - 107

7. Brown EJ. Female injecting drug users: human immonodeficiency virus risk behaviour and intervention needs. J Prof Nurs 1998 Nov-Dec; 14(6):361 - 369.

8. Hoffman JA, Klein H, Clark DC, Boyd FT. The effect of entering drug treatment on involvement in HIV-related risk behaviors. Am J Drug Alcohol Abuse 1998 May; 24(2):259 - 284.

9. Zaric GS, Barnett PG, Brandeau ML. HIV Transmission and the cost-effectiveness of methadone maintenance. Am J Public Health 2000 July; 90(7):1100 - 1111.

10. Compton WM, Cottler LB, Ben-Abdallah A, et al. The effects of psychiatric comorbidity on response to an HIV prevention intervention. Drug Alcohol Depend 2000 Mar 1; 58(3):247 - 257.

11. Broadhead RS, Heckathorn DD, Weakliem DL, et al. Harnessing peer networks as an instrument in AIDS prevention: results from a peer driven intervention. Public Health Rep 1998 June; 113 Suppl 1: 42 - 57.

12. Neaigus A. The network approach and interventions to prevent HIV among injection drug users. Public Health Rep 1998 June; 113 Suppl 1: 140 - 150.

13. Garfein RS, Vlahov D, Galai N, et al. Viral infections in short-term injection drug users; the prevalence of hepatitis C, hepatitis B, human immunodeficiency, and human T-lymphotropic viruses. Am J Public Health 1996; 86: 655 - 661.

14. Alter MJ, Moyer LA. The importance of preventing hepatitis C virus infection among injection drug users in the United States. J Acquired Immune Defic Syndr Hum Retrovirol 1998; 18 Suppl 1: S6 - S10.

15. Heimer R, Clair S, Grau LE, et al. Hepatitis associated knowledge is low and risks are high among HIV-aware injection drug users in three U.S. cities. Addiction 2002 Oct;97(10): 1277 - 1287.

16. Murrill CS, Weeks H, Castrucci BC, et al. Age-specific seroprevalence of HIV, hepatitis B virus, hepatitis C virus infection among injection drug users admitted to drug treatment in 6 U.S. cities. Am J Public Health 2002 Mar;92(3):385 - 387.

17. Clatts MC, Heimer R, Abdala N, et al. HIV-1 transmission in injection paraphernalia: heating drug solutions may inactivate HIV-1. J Acquired Immune Defic Syndr 1999: 22:194 - 199.

18. Abdala N, Gleghorn AA, Carney JM, Heimer R. Can HIV-1 contaminated syringes be disinfected? Implications for transmission among injection drug users. J Acquir Immune Defic Syndr 2001 Dec15;28(5):487 - 494.

19. Monterroso ER, Hamburger ME, Vlahov D, et al. Prevention of HIV infection in street-recruited injection drug users. The Collaborative Injection Drug Users Study (CIDUS). J Acquir Immune Defic Syndr 2000 Sep 1;25(1):63 - 70.

20. Kapadia F, Vlahov D, Des Jarlais DC, et al. Does bleach disinfection of syringes protect against hepatitis C infection among young adult injection drug users? Epidemiology 2002 Nov;13(6):738 - 741.

21. Hagan H, Thiede H, Weiss NS, et al. Sharing of drug preparation equipment as a risk factor for hepatitis C. Am J Public Health 2001 Jan;91(1):38 -42.

22. Garfein RS, Doherty MC, Monterroso ER, et al. Prevalence and incidence of hepatitis C infection among young adult injection drug users. J Acquired Immune Defic Syndr 1998 July 18;Suppl 1: S11 - S19.

23. Miller CL, Johnston C, Spittal PM, et al. Opportunities for prevention: hepatitis C prevalence and incidence in a cohort of young injection drug users. Hepatology 2002 Sep;36(3):737 - 742.

24. Fuller CM, Vlahov D, Arria AM, et al. Factors associated with adolescent initiation of injection drug use. Public Health Rep 2001;116 Suppl 1:136 - 145.

25. Thorpe LE, Ouellet LJ, Levy JR, et al. Hepatitis C virus infection: prevalence, risk factors, and prevention opportunities among young injection drug users in Chicago, 1997 - 1999. J Infect Dis 2000 Dec;182(6):1588 - 1594.

26. Lifson AR, Halcon LL. Substance abuse and high-risk needle behaviors among homeless youth in Minneapolis: implications for prevention. J Urban Health 2001 Dec;78(4):690 - 698.

27. Willis J. Systemic infections of heroin addicts. Lancet 1968 Feb 17;(7538):361.

28. Brown PD, Levine DP. Infective endocarditis in the injection drug user. Infect Dis Clin North Am 2002 Sep;16(3):645 - 665, viii - ix.

29. Julander I. Staphylococcal septcaemia and endocarditis in 80 drug addicts. Aspects on epidemiology, clinical and laboratory findings and prognosis. Scand J Infect Dis Suppl 1983;41:49 - 55.

30. Binswanger IA, Kral AH, Bluthenthal RN, et al. High prevalence of abscesses and cellulitis among community-recruited injection drug users in San Francisco. Clin Infect Dis 2000 Mar;30(3):579 - 581.

31. Centers for Disease Control and Prevention. Tetanus among injecting-drug-users-California, 1997. Morb Mortal Wkly Rep 1998;47:149 - 151.

32. Passaro DJ, Werner SB, McGee J, et al. Wound botulism associated with black tar heroin among injecting drug users. JAMA 1998;279:859 - 863.

33. Thompson BD. Medical complications following intravenous heroin. J Arizona Med. 1975;32:798 - 801.

34. Harrison DW, Walls RM. "Cotton fever": a benign febrile syndrome in intravenous drug abusers. J Emerg Med 1990 Mar - Apr;8(2):135 - 139.

35. Ferguson R, Feeney C, Chirurgi VA. Enterobacter agglomerans--associated cotton fever. Arch Intern Med 1993 Oct 25;153(20):2281 - 2282.

36. National Institute of Drug Abuse. NIDA annual emergency room data 1995: data from the drug abuse warning network (DAWN). Department of Health and Human Services Publication No 95 - 1955, Series 1, 11A.

37. Ochoa KC, Hahn JA, Seal KH, Moss AR. Overdosing among young injection drug users in San Francisco. Addict Behav 2001 May-Jun;26(3):453 - 460.