HIV and HCV discordant injecting partners and their association to drug equipment sharing

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Abstract

Our objective was to examine the association between HIV and HCV discordant infection status and the sharing of drug equipment by injection drug users (IDUs). IDUs were recruited from syringe exchange and methadone treatment programmes in Montreal, Canada. Characteristics of participants and their injecting partners were elicited using a structured questionnaire. Among 159 participants and 245 injecting partners, sharing of syringes and drug preparation equipment did not differ between concordant or discordant partners, although HIV-positive subjects did not share with HIV-negative injectors. Sharing of syringes was positively associated with discordant HIV status (OR = 1.85) and negatively with discordant HCV status (OR = 0.65), but both results were not statistically significant. Sharing of drug preparation equipment was positively associated with both discordant HIV (OR = 1.61) and HCV (OR = 1.18) status, but both results were non-significant. Factors such as large injecting networks, frequent mutual injections, younger age, and male gender were stronger predictors of equipment sharing. In conclusion, IDUs do not appear to discriminate drug equipment sharing partners based at least on their HCV infection status. The results warrant greater screening to raise awareness of infection status, post-test counselling to promote status disclosure among partners, and skill-building to avoid equipment sharing between discordant partners.

Introduction

In Montreal, Canada, recent data from an HIV and HCV risk surveillance study of injection drug use (SurvUDI) show prevalence rates of 18% and 68% for HIV and HCV, respectively.

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The incidence rate among IDUs of HIV was estimated at approximately 4 per 100 person-years (py) and for HCV at 26 per 100 py [1]. In Montreal and elsewhere, a range of preventive measures for blood-borne viruses has been developed since the 1980s to circumvent the risk associated with shared drug equipment. Syringe exchange programmes (SEPs) form the cornerstone of prevention efforts for the distribution of sterile injection equipment. The lower incidence of HIV that followed the wider availability of sterile syringes during the 1990s coincided with an era of heightened promotion of reduced syringe sharing [2,3]. However, despite the long existence of prevention programmes, syringes and drug preparation equipment continue to be shared by some IDUs [3–5]. As of 2005, 11 SEPs, 11 community health centres (CLSC), 2 methadone clinics, and 150 participating pharmacies across Montreal were distributing or selling sterile equipment for a target population of over 12,000 IDUs [6].

Injection risk behaviours are determined by knowledge, perceptions, and attitudes towards HIV or HCV infection [7,8]. Psychosocial models such as the AIDS Risk Reduction Model propose that an individual's assessment of personal risk of disease influences his or her behaviour [9]. The notion of risk assessment seems to be especially pertinent to drug injecting partnerships characterized by HIV or HCV discordant pairs where one sharing partner is positive and the other is negative for infection. Previous research implies that IDUs are more likely to borrow and lend within established partnerships because they perceive their partners to be at low risk for HIV. They may be more discriminating in accepting and passing on used needles and syringes, especially with unknown people to whom more lending than borrowing is likely to occur [10–12]. These risk reduction behaviours may not be borne out in all IDU populations in which awareness of one's own infection status, and possibly the status of partners, may be unknown or assumed. However, even when known, knowledge of partners' status can have minimal impact on the decision to share equipment [13–16].

The aim of the current study was to examine whether the concordance of infection status between IDUs who inject together is associated with sharing syringes or drug preparation equipment.

Methods

Study design and population

This study was part of a larger project consisting of 321 IDUs aimed at understanding HCV related psychosocial factors and risk behaviours in Montreal. IDUs who injected at least once in the past 6 months were recruited from 3 of the largest SEPs and 2 methadone clinics in Montreal, Canada, between April 2004 and January 2005. The methadone clients were selected for their recent initiation to treatment which made them comparable in terms of drug use and health status to the SEP-recruited sample. Previous research confirms that while the majority of methadone patients eventually reduce drug use, some continue to inject during the early months of treatment and maintain pre-treatment risk behaviours [17].

The study was promoted by posting flyers at selected recruitment sites, word of mouth, and through site personnel. Systematic sampling of every second client who sought services at

the recruitment sites was used to minimize selection bias. Interviews were conducted in a private room on site or arranged at the Montreal Regional Public Health Department whenever appropriate.

Eligibility for participation was verified by the presence of injection marks or through knowledge about community services offered to IDUs and of typical injection procedures. Participants were at least 18 years of age, provided informed consent and were compensated CDN\$20 for their time. Participants underwent an anonymous, face-to-face interview that lasted on average 90 min. Data were collected using a structured questionnaire administered by trained study interviewers who were hired for their previous work experience with marginalized populations, including IDUs. All persons approached for participation were offered referrals to relevant community services for drug users. The study response rate could not be calculated since a list of refusals was not maintained. The study procedures were approved by the McGill University Faculty of Medicine Institutional Review Board for Research on Human Subjects.

Data collection

The development of the questionnaire on injection risk behaviours has been described previously [11,14]. Information was elicited about participants' sociodemographics (age, gender, ethnicity, education, income, housing), health status (self-rated mental and physical health, HIV and HCV testing history, self-reported HIV and HCV infection status), and drug use practices (y injecting, drugs injected, frequency and location of injecting, and patterns of drug sharing).

The social network portion of the questionnaire elicited information about personal (egocentric) networks, in which social links are described from the perspective of the study participant (or index subject). Using a network survey modelled on the General Social Survey [18] and the Social Network List [19], participants were asked to list individuals (by giving pseudonyms or initials) in their personal network during the past 1 month. Up to 10 individuals (including up to 5 IDUs) were identified with whom there was significant contact (defined as individuals who played important roles in the subject's life: 1) drug injecting partner, 2) sexual partner, 3) sexual client, 4) family member, 5) social support (e.g. friend, coworker), 6) drug dealer, 7) acquaintance, or 8) other relationship as specified by the participant). Memory-enhancing cues, such as examples of persons who might represent network members in different contexts of social interactions, were used to elicit the nomination of network members [20]. For the purpose of analysis, network members were later re-classified into 3 social subnetworks defined by the researchers as social support (family member or social support), sexual (sexual partner not including sexual clients), and injection drug user (including individuals who did or did not share drugs or injection equipment). Network members could have more than 1 relationship.

Variables included demographics (age, gender, relationship to index, duration of relationship, size of social network and injecting sub-network). For network members identified as IDUs, variables of interest included the drug injection practices of members (y injecting, drugs injected, proportion of index's injections with the member, place and frequency of injecting together with the index, sharing (borrowing and/or lending) of

syringes or drug preparation equipment with the index), current use of a SEP or methadone programme, and perceived HIV and HCV infection status of the network member. From the network data, we determined 1) the number of partnerships between the index and each of his or her network members that were HIV and HCV discordant; and 2) the network turnover rate, which measures network membership change as the number of new network injectors in the past month divided by the number of network injectors in the past 6 months.

The 2 dependent variables of interest were 1) sharing of syringes, and 2) sharing of drug preparation equipment (containers, filters, and water for drug mixing) with IDU network members. We chose to examine sharing of syringes collectively rather than separating this behaviour into borrowing and lending since most (83.6%) IDUs in this sample who borrowed also lent syringes. Similarly, most (88.6%) of those who borrowed drug preparation equipment also lent these materials.

Statistical analysis

We selected the subsample of 159 participants who provided HIV or HCV information about themselves and their IDU network members. The selection yielded 245 injecting partnerships (i.e. index and network member) with available information on HIV and/or HCV status for the pair.

Generalized estimating equations (GEE) regression analysis [21] was used to examine the association of sharing with independent variables. To select the multivariate models, independent variables were entered sequentially into the model and the change in the quasi-likelihood was examined between the modified and more parsimonious models. A statistically significant change was used to exclude variables from the final model, except for the HIV and HCV concordance variables that were retained in the model to estimate their effect. The model selection procedure was repeated by backward elimination of variables from a full model in order to corroborate the modelling strategy using forward sequential entry of variables. Variables to be modelled were based on prior substantive knowledge from the medical literature and on hypothesized associations. All models were controlled for the index subject's age and gender. Effect modification was considered for age and gender with the HIV or HCV status concordance of injecting partners, as well as with other covariates.

Results

The 159 index subjects identified a total of 245 injecting partners in their social networks in the past month. For the index subjects, the mean age was 32 years, 70% were male, 95% were Caucasian, 67% injected primarily cocaine in the past 6 months, 19% were HIV-positive, and 62% were HCV-positive (Table I). Approximately 21% of index subjects borrowed and 16% lent syringes to a drug injecting network member in the past month. Drug preparation equipment was borrowed by 33% and lent by 30% of subjects. Of the 245 injecting partners, 29% were HIV-positive and 58% were HCV-positive, as reported by index subjects.

As shown in Table II, the proportion of syringe and drug preparation equipment sharing was similar between discordant and concordant partners, except for HIV-positive index subjects

who did not share with their HIV-negative (i.e. discordant) partners. It is also noteworthy that fewer HCV-negative subjects shared drug preparation equipment with their HCV-positive than their HCV-negative injecting partners.

In univariate analysis (Table III), sharing was associated with the index subject's younger age, male gender, size of the injecting network, injecting partner's age, and the proportion of injections together with partner. In the model adjusted for the index subject's age and gender (Table III), HIV discordant partnerships were more likely to share syringes and HCV discordant partners were less likely to share, but both findings were not significant. Instead, syringe sharing was significantly more likely to occur within larger injecting networks (OR = 1.45 per member), within partnerships that had a high proportion of injections together (OR = 1.30).

In univariate analysis (Table IV), equipment sharing was associated with younger age of the index, male gender of the index, injecting in public places with the partner, and with a high proportion of injections together with partner. In adjusted analyses (Table IV), HIV and HCV discordant partners were more likely to share but, as with syringe sharing, the findings were not significant. Instead, sharing was more likely to occur with younger age of the index (OR = 0.95 per y), male gender (OR = 2.60), and a higher proportion of injections together with a partner (OR = 1.24).

Discussion

This study suggests that HIV and HCV discordant injecting partnerships, for which the risk of infection transmission is highest, were no different from concordant partnerships with regard to sharing syringes and drug preparation equipment. Instead, structural network characteristics such as network size and the proportion of injections together with network members seem to play a more substantial role. Large IDU network size has been associated with a higher motivation to comply with peer pressure for injecting with previously used equipment and provides more sources of potentially contaminated injecting equipment [22,23]. The implications for disease transmission within large IDU networks are also clear given that an IDU's risk of infection with blood-borne viruses depends on the number of potentially infected network members with whom equipment is shared and on the likelihood that a network member is infected. A high proportion of mutual injections is often a marker for frequent contact between individuals who are regular injecting partners and who may be socially close [22]. IDUs who inject regularly together and who remain free of infection may perceive that they are not at risk of infection. Aside from structural traits of the IDU network, there was no association of syringe sharing with an injecting partner's demographic attributes, which is consistent with some previous research [24]. On the other hand, the sharing of drug preparation equipment is possibly less discriminatory than syringes, especially between younger, male IDUs, as indicated by the marginally greater likelihood of sharing in these groups.

The lack of difference in sharing behaviour between concordant and discordant partnerships implies that awareness of a partner's infection status has limited impact on the sharing of drug injection equipment. It is noteworthy, however, that HIV discordant partners, but not

HCV discordant partners, were more likely to share syringes and drug preparation equipment, although both findings were not statistically significant. Moreover, none of the HIV-positive subjects shared either syringes or drug preparation equipment with their injecting partners during the past month. There are several possible explanations for these findings. First, there is probably greater disclosure of HIV status than HCV status between IDUs as a result of more HIV screening and knowledge of HIV risk factors [16]. Since there has also generally been a greater emphasis on HIV in prevention programmes for IDUs in Montreal, the stigma associated with this infection may be diminishing [25] and thereby minimizing the importance of HIV status disclosure when sharing injecting equipment. Finally, IDUs may be experiencing HIV risk reduction 'fatigue', as has been observed in populations of men who have sex with men [26]. As a result, HIV discordant partners may feel less motivated than HCV discordant partners to avoid risky sharing. Given that HCV prevalence among IDUs in Montreal is high (approximately 60%) [1], it is not surprising that most injecting partnerships would be concordant for HCV status and be positively associated with equipment sharing even when rates of sharing are low. Previous work has shown that sharing is often independent of personal infection status and possibly also unrelated to an injecting partner's infection status [14–16,27,28].

Although disclosing infection status is one risk reduction strategy employed by some IDUs [29], several factors may dissuade injecting partners from revealing their status, especially when IDUs are positive for HIV or HCV. These factors may include potential stigmatization and exclusion from drug using networks and resources. Even when status is disclosed, a refusal to share equipment might be perceived as a lack of trust in the injecting relationship. In a study in Hungary, Gyarmathy et al. attributed high HIV and HCV disclosure norms among IDUs to timely public health prevention messages [30]. However, it was also found that risky injection and sex practices existed alongside status disclosure, possibly as a result of low perceived risk of infection in close injecting relationships. In other words, closeness of relationships may override considerations of infection status, whether discordant or not.

Limitations

The current study has several limitations. First, respondents were asked about their injecting partner's infection status but not asked about the source or accuracy of this information. IDUs in this sample are aware of HIV and HCV risk factors [8], and although there was no validation of reported infection status by antibody testing, there is some evidence that self-reported infection status information about self and about others is reasonably valid [31,32]. There is also some reassurance in the validity of proxy reports of HIV and HCV infection for network members as the prevalence of infection approximates the expected prevalence rates in the Montreal IDU population. However, for the purpose of understanding the motivation for equipment sharing, it is the perceived infection status of injecting partners and its influence on behaviours that is of primary interest.

Secondly, information on situational and environmental factors, such as access and use of harm reduction services or drug withdrawal symptoms during occasions of sharing, was not considered in the analysis but may inform future research on this topic. Moreover,

information about the degree of closeness between IDUs may help to better characterize the injecting relationships that were studied.

Finally, due to the cross-sectional nature of the study, it is not possible to determine whether the formation of the observed networks occurred in response to an awareness of infection status of partners or whether the infection status of participants and their network members are the result of their sharing relationship.

Implications

This study suggests a need for 1) more emphasis in prevention education about the risks associated with sharing equipment other than syringes; 2) raising awareness of infection status and its implications, through regular HIV and HCV screening and post-test counselling of at-risk IDUs; 3) creating norms for easier disclosure of infection status within injecting partnerships; and 4) developing skills to recognize and remove oneself from injecting partnerships in which risk of infection is high.

Although behaviour change is reported to be more difficult within established and intimate relationships, these are also the relationships in which a concern for the well-being of others can be harnessed for the purpose of harm reduction [25]. There is some evidence that IDUs avoid infection by restricting their injecting networks or by prioritizing their order of injecting to allow those who are believed to be uninfected to inject first [29]. Other high-risk groups such as men who have sex with men have been known to use strategies such as serosorting to reduce transmission risk, whereby sex partners are selected because of their concordant infection status [26]. Further research is needed to determine whether IDUs employ similar risk reduction behaviours and, if not, to identify the barriers to such practices.

Conclusion

IDUs do not appear to discriminate equipment sharing partners based on HIV or HCV infection status, except for subjects who are HIV status discordant. It is important for prevention programmes to improve the awareness of infection status through more regular HIV and HCV screening and to better educate IDUs about the utility of infection status disclosure within their injecting networks.

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Table I

Characteristics of index subjects and their reported drug injecting partners in Montreal, Canada, 2004–2005.

Index subjects (n = 159)	n	(%)
Age (y, mean (SD))	32.0	8.8
Gender		
Male	112	70.4
Female	47	29.6
Ethnicity		
Caucasian	151	95.0
Canadian Aboriginal	4	2.5
Black	2	1.3
Oriental/South Asian	2	1.2
Education high school	121	76.6
Income <\$20,000	119	74.8
Housing unstable★	62	39.2
Self-rated poor physical health★	76	48.1
Self-rated poor mental health★	77	48.7
HIV test during past y	126	84.0
Self-reported HIV-positive	28	19.3
HCV test during past y	116	80.6
Self-reported HCV-positive	86	61.9
HIV-HCV coinfectd	23	16.9
Y injecting (mean, range)	11.9	0.3–35.7
Drug most commonly injected★		
Cocaine	107	67.3
Heroin	28	17.6
Other‡	24	15.1
Daily injecting‡	63	42.3
Public injecting‡	50	39.7
Require or provide help injecting★	81	50.9
Shared drug solution with injecting partner★	117	73.6
Size of social network (mean, range)	3.32	1–10
Size of drug injecting network (mean, range)	2.35	1–6
Injecting partner (past month) (n = 245)	n	(%)
Age (y, mean (SD))	31.2	9.1
Gender		
Male	154	62.9
Female	84	34.3
Not reported	7	2.8
Other social role of member		

Index subjects (<i>n</i> = 159)	<i>n</i>	(%)
Sexual partner	77	31.4
Social support	113	46.1
Reported HIV status		
HIV+	71	29.0
HIV–	174	71.0
Reported HCV status		
HCV+	142	58.0
HCV–	103	42.0
Y injecting (mean, range)	7.6	0.08–35.0
Drugs injected		
Cocaine	177	72.2
Heroin	42	17.1
Other	26	10.6
Injects daily	111	52.1
Ever injected in shooting gallery	87	50.9
Currently uses methadone or SEP	188	85.1
Mean proportion of index's total injections with partner (range)	36.5	0–100
Shared syringes		
Borrowed from index	44	21.3
Lent to index	34	16.4
Shared drug preparation equipment		
Borrowed from index	80	32.7
Lent to index	73	29.8

Note: Percentage among respondents with non-missing data; each index subject may report more than 1 injecting partner; characteristics of injecting partners refer to the past month.

★ Refers to past 6 months.

† Refers to past month.

‡ Major categories are speedball, amphetamines, methamphetamines.

Table II

Distribution of syringe and drug preparation equipment sharing, stratified by the index subject's HIV or HCV infection status.

Reported infection status of index subjects★ (n = 159)			Reported infection status of injecting partners† (n = 245)			Drug injecting partnerships		
HIV status	No.		HIV status	Status concordance	No.	Syringes shared (%)★	Drug preparation equipment shared (%)	
+	28		+	concordant	36	15/36 (41.7)	20/36 (55.6)	
			-	discordant	12	0/12 (0)	0/12 (0)	
-	117		+	discordant	26	5/26 (19.2)	9/26 (34.6)	
			-	concordant	151	29/151 (19.2)	55/151 (36.4)	
HCV status	No.		HCV status	Status concordance	No.	Syringes shared (%)★	Drug preparation equipment shared (%)	
+	86		+	concordant	102	22/102 (21.6)	42/102 (41.2)	
			-	discordant	37	10/37 (27.0)	13/37 (35.1)	
-	53		+	discordant	29	5/29 (17.2)	6/29 (20.7)	
			-	concordant	51	8/51 (15.7)	18/51 (35.3)	

★Total may not sum to 159 because some subjects did not report their HIV or HCV status.

†Total may not sum to 245 because not all partners had their HIV or HCV status reported by indexes.

Table III

Results of GEE analysis of characteristics of index subjects and network members in relation to syringe sharing among 245 injecting partnerships.

Index subject	No. sharing syringes (<i>n</i> = 51)	%	No. not sharing syringes (<i>n</i> = 194)	%	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Mean age (y, SD)★	30.2 (8.6)	–	31.2 (8.2)	–	0.91 (0.87–0.98)	0.96 (0.92–1.01)
Male	41/51	80.7	122/189	64.6	2.25 (1.06–4.78)	2.43 (0.98–6.01)
Self-reported HIV-positive	15/49	30.6	33/176	18.8	1.91 (0.93–3.91)	
Self-reported HCV-positive	32/45	71.1	107/174	61.5	1.54 (0.76–3.14)	
IDU network and injecting partner						
Mean size of network (per member, SD)†	2.9 (1.7)	–	2.3 (1.4)	–	1.32 (0.99–1.79)	1.45 (1.10–1.92)
Mean proportion of injections together with index (SD)	52.1 (26.3)	–	32.2 (28.9)	–	1.44 (1.24–1.59)	1.30 (1.15–1.48)
Male	36/51	70.6	118/187	63.1	1.40 (0.72–2.75)	
Public injecting together	26/47	55.3	70/137	51.1	1.18 (0.61–2.30)	
Provides social support	22/51	43.1	91/194	46.9	0.86 (0.46–1.60)	
Is a sexual partner	16/51	31.4	61/194	31.4	1.00 (0.51–1.94)	
HIV status discordant with index	44/49	89.8	143/176	81.2	2.04 (0.75–5.56)	1.85 (0.60–5.88)
HCV status discordant with index	30/45	66.7	125/174	71.8	0.78 (0.39–1.59)	0.65 (0.28–1.45)

OR: odds ratio; CI: confidence interval; SD: standard deviation.

Note: Model adjusted for age and gender of index.

★ Odds ratio per y.

† Odds ratio per member.

Results of GEE analysis of characteristics of index subjects and network members in relation to drug preparation equipment sharing among 245 injecting partnerships.

Table IV

Index subject	No. sharing drug preparation equipment (<i>n</i> = 87)	%	No. not sharing drug preparation equipment (<i>n</i> = 158)	%	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Mean age (y, SD) ★	30.3 (8.1)	–	31.4 (8.4)	–	0.90 (0.84–0.94)	0.95 (0.91–0.99)
Male	67/87	77.0	96/153	62.7	1.99 (1.09–3.61)	2.60 (1.24–5.43)
Self-reported HIV-positive	20/84	23.8	28/141	19.9	1.26 (0.66–2.42)	
Self-reported HCV-positive	55/79	69.6	84/140	60.0	1.53 (0.85–2.75)	
IDU network and injecting partner						
Mean size of network (per member, SD) †	2.7 (1.4)	–	2.3 (1.5)	–	1.26 (0.91–1.65)	
Mean proportion of injections together with index (SD)	47.5 (27.2)	–	29.5 (28.9)	–	1.46 (1.20–1.67)	1.24 (1.12–1.38)
Male	57/85	67.1	97/153	63.3	1.18 (0.67–2.06)	
Public injecting together	48/78	61.5	48/106	45.3	1.93 (1.07–3.51)	
Provides social support	38/87	43.7	75/158	47.5	0.86 (0.51–1.45)	
Is a sexual partner	26/87	29.9	51/158	32.3	0.89 (0.51–1.58)	
HIV status discordant with index	75/84	89.3	112/141	79.4	2.17 (0.97–4.76)	1.61 (0.65–4.00)
HCV status discordant with index	60/79	75.9	95/140	67.9	1.49 (0.80–2.78)	1.18 (0.57–2.38)

OR: odds ratio; CI: confidence interval; SD: standard deviation.

Note: Model adjusted for age and gender of index.

★ Odds ratio per y

† Odds ratio per member