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Perceived Severity of and Susceptibility to Overdose among Injection Drug Users: Relationships with Overdose History

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Abstract

Background—Overdose is relatively common among injection drug users (IDUs) yet little is known about how overdose-related health beliefs influence overdose experiences or risk reduction.

Objectives—This study examines the association of perceived susceptibility to and perceived severity of non-fatal overdose with overdose history among IDUs attending needle exchange programs (NEPs) to inform prevention efforts.

Methods—In 2009–2010, IDUs ($N = 91$) attending NEPs completed self-report surveys. Negative binomial regression modeled the association between demographics, age of injection initiation, length of time attending the NEP, perceived severity of overdose, and perceived susceptibility to overdose with lifetime history of non-fatal overdose.

Results—Over half (55%) of participants reported lifetime overdose, with a mean of 2.9 overdoses. A multivariable negative binomial regression model revealed that younger current age, older age of first injection, non-Caucasian race, higher perceived severity of overdose, and lower perceived susceptibility to overdose were significantly correlated with fewer lifetime overdoses.

Conclusions—Although our methodology precludes causal inferences, these findings are consistent with the hypothesis that perceived severity and perceived susceptibility are among several factors associated with IDUs' use of protective behaviors, which could influence the likelihood of overdose. Future prospective research to explore the impact of this and other health beliefs on risk behaviors and overdose could help improve the effectiveness of behavioral interventions.

Keywords

injection drug use; overdose; health beliefs; severity; susceptibility

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Introduction

Up to 58% of injection drug users (IDUs) have experienced a non-fatal overdose (e.g., Darke, Ross, & Hall, 1996; Kerr et al., 2007), which may cause significant morbidity (Warner-Smith, Darke, & Day, 2002). Additionally, overdoses are the leading cause of death among IDUs (Evans et al., 2012; Vlahov et al., 2008). Interventions to reduce overdose morbidity and mortality commonly involve providing overdose education (e.g., Seal et al., 2005; Sherman et al., 2009), naloxone (e.g., Doe-Simkins, Walley, Epstein, & Moyer, 2009; Walley et al., 2013) and/or cardiopulmonary resuscitation training. The strongest evidence to date for these overdose prevention interventions comes from an observational study of overdose rates after implementing bystander-focused programs (Walley et al., 2013).

The potential for these interventions to modify overdose risk behavior, along with witnessed overdose response, may be informed by theories of health behavior. The Health Belief Model (HBM; Rosenstock, 1966) suggests that cognitions about health outcomes influence engagement in preventive behaviors. The HBM posits that perceived susceptibility (e.g., likelihood of overdose) and perceived severity (e.g., seriousness of overdose) of a health outcome influences whether one engages in preventive behavior (e.g., overdose prevention strategies) and that more perceived benefits of and fewer perceived barriers to engaging in the preventive behavior are also promotive.

Prior research suggests IDUs' health beliefs are associated with injection behavior. For example, lower perceived severity of HIV and Hepatitis C was associated with more receptive syringe sharing (Bailey et al., 2007). Perceived susceptibility to HIV was related to safe injection practices (Falck, Siegal, Wang, & Carlson, 1995; Jamner, Corby, & Wolitski, 1996). However, most prior studies did not assess beliefs regarding overdose. An exception is one study that reported that 73% of heroin users reported "rarely" or "never" worrying about overdoses, and those with recent overdoses believed they were more susceptible to future overdose (McGregor, Darke, Ali, & Christie, 1998). One qualitative study suggested that heroin users' beliefs about their invincibility (i.e., low perceived susceptibility) were one of many factors that undermined overdose prevention messaging (Kerr, Small, Hyshka, Maher, & Shannon, 2013). Among IDUs, if overdose-related beliefs are associated with efforts to reduce one's own risk of overdose *or* prior overdose experiences, then understanding these beliefs could inform overdose prevention interventions focused on reducing overdose risk behaviors. Therefore, in the present study, we evaluate whether IDUs' perceived susceptibility to and perceived severity of overdose were related to their overdose history.

Method

Participants and Procedure

As part of a larger survey study, (Bonar & Rosenberg, 2011), 91 IDUs were recruited from three Needle Exchange Programs (NEPs) in the Midwestern United States. Eligible participants were: enrolled in the NEP, age 18 or older, able to speak English, and injecting at least once a week during the previous three months. The first author or a graduate student research assistant read the consent document and questionnaires to participants while they

held copies of surveys and pointed to or said answers aloud. The interviewer recorded answers on paper copies of the questionnaires. Compensation was a $10 gift card to a grocery. We received approval from our institutional review board and NEPs.

Measures

This analysis used the six items from the Harm Reduction Health Beliefs Questionnaire (Bonar & Rosenberg, 2011; copy available from first author) that measured perceived severity of non-fatal overdose (e.g., “If, in the next 3 months, you experienced a non-fatal overdose from injecting street drugs how big of an impact would it have on your life?”) and perceived susceptibility to non-fatal overdose (e.g., “What is the risk you will have a non-fatal overdose from injecting street drugs over the next 3 months?”). Participants provided responses on a 5-point scale where higher scores indicated greater perceived severity and susceptibility. Internal consistency reliability was acceptable (severity $\alpha = .85$, susceptibility $\alpha = .73$). Overdose history was assessed by the yes/no item: “Have you ever overdosed on any injected drug?” and followed by asking the number of lifetime overdoses experienced (our dependent measure). In order to capture a broad range of potential overdose experiences, overdose was not defined based on symptoms or severity, but instead was based on their own perceptions that overdose had occurred. Other measures were demographics, drug use history, and length of NEP attendance.

Data Analysis

IBM SPSS version 20 was used for data analyses. Descriptive statistics for the sample were computed. Due to the skew in the distribution of the dependent measure of number of overdoses, Spearman’s rho was used to evaluate independent bivariate relationships between sample characteristics and overdose history. Variance for the measure of number of lifetime overdoses was over-dispersed, thus a negative binomial regression analysis was used to evaluate the association of number of overdoses with age, gender, race/ethnicity (Caucasian/Non-Caucasian), age of initiating IDU, months attending the NEP, and perceived severity and susceptibility. The substances typically associated with overdose (e.g., heroin, prescription opioids, cocaine) were not included because 95% of the sample had used at least two of these substances, and 65% used all three. However, substance use history was represented by including age at which injecting began, which has been associated with overdose (Powis et al., 1999).

Results

Of the 91 participants, 77% were male; 54% were non-Caucasian; 88% said that heroin was the substance they used most often; their mean age was 45.3 years ($SD = 11.3$). On average participants had attended the NEP for 45 months ($SD = 51.3$ months); 15% were attending the NEP for the first time when recruited. Over half (55%) reported a previous overdose, with a mean of 2.9 overdoses ($SD = 5.3$). Table 1 displays demographics; additional sample information is previously published (Bonar & Rosenberg, 2011).

Bivariate analyses (see Table 1) revealed that older current age and number of months attending the NEP were significantly positively associated with number of overdoses. Older

age of IDU initiation was significantly associated with fewer overdoses. Higher perceived severity of overdose was associated with having reported fewer overdoses. Perceived susceptibility was not significant, but was included in the subsequent regression model as a primary variable of interest.

The negative binomial regression model evaluating relationships of overdose history was significant (p <.001; Table 1). In this model, length of time attending the NEP became non-significant, but significant relationships remained between number of overdoses and current age, age of first injection, and perceived severity. In addition, Non-Caucasian race and perceived susceptibility were significantly associated with experiencing more overdoses.

Discussion

These results demonstrate statistically significant, although perhaps clinically modest, associations of two specific beliefs with the number of overdoses reported by a sample of IDUs. Specifically, when accounting for background factors, higher perceived severity of overdose was associated with fewer overdoses and higher perceived susceptibility to overdose was associated with more prior overdoses. Although cross-sectional methods preclude causal conclusions, these findings are consistent with the hypothesis that these health beliefs are factors that could influence IDUs' intentions to use overdose-related risk-reduction behaviors.

There are multiple possible interpretations of the finding for perceived severity. First, having survived one or more overdoses may decrease one's perception of overdose severity. Alternatively, individuals who perceive overdoses as more severe may use more risk reduction strategies. Additionally, this finding could be due to other differences influencing severity and overdose that were not assessed. Current perceived susceptibility may be influenced by past overdoses and a belief that, if one has had multiple non-fatal overdoses, he/she is likely to overdose again; although previous qualitative findings indicated that heroin users who experienced non-fatal overdose events viewed *fatal* overdose as unlikely (Kerr et al., 2013). Those who believe overdose is inevitable may take fewer actions to reduce their risk. The degree to which heightened susceptibility influences use of risk reduction is unknown, though has been associated with stronger behavioral intentions to inject test shots (Bonar & Rosenberg, 2011).

There are limitations associated with this initial exploration of the relationships between health beliefs and overdose. First, these data are cross-sectional and consist of retrospective self-report information. Because questionnaires were read aloud to participants, social desirability may have influenced responses. Participants were already engaged in the health-preserving behavior of obtaining clean needles and could have previously been exposed to information on reducing overdose risk, potentially affecting their health beliefs. Thus, this sample's beliefs regarding overdose outcomes may differ from those of IDUs who engage in riskier use, who reside in different regions, or who have not been exposed to harm reduction outreach. We asked IDUs about their beliefs regarding *non-fatal* overdose from injecting. Relationships between health beliefs and *fatal* overdose or overdose from other methods may differ. We hypothesized that perceived severity of *fatal* overdose would be uniform

given that the outcome is death, so we assessed *non-fatal* overdose to capture a range in severity beliefs (Bonar & Rosenberg, 2011). Furthermore, there is inconsistency in how overdose history is assessed in the literature; thus it is possible that results could differ if lifetime overdoses were measured with a specific definition or method.

Further research is needed to understand whether these health beliefs influence behaviors that either increase or decrease the risk of overdose. Research evaluating these relationships can be improved through prospective designs and more thorough assessments of overdose-related cognitions (e.g., ecological momentary assessment proximal to substance use). Longitudinal research should consider the possibility of a bi-directional relationship between beliefs and overdose, mediated by risk reduction practices. Future research could also consider the role of witnessing overdoses in forming health beliefs and the extent to which overdose knowledge (Behar, Santos, Wheeler, Rowe, & Coffin, 2015; Green, Heimer, & Grau, 2008) may relate to severity and susceptibility beliefs.

To the extent that these health beliefs impact risky injecting behaviors, they may be appropriate targets for cognitive-behavioral interventions. Although such interventions remain to be tested, non-confrontational approaches to raise concern to raise concern about overdose morbidity and mortality may increase perceived severity. Perceived susceptibility may be raised through normative feedback on community rates of overdoses. If effective, norm resetting may be important given how prior research suggests low susceptibility may hamper the impact of prevention messaging (Kerr et al., 2013). However, changes in these cognitions about overdose may not be sufficient to produce changes in injecting behaviors, and such interventions could be enhanced by including behavioral overdose prevention skills (e.g., injecting test shots, switching to non-injecting routes of administration, etc.) in combination with overdose response training.

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Glossary/Key terms

OVERDOSE
To experience serious adverse health effects as a result of taking a greater quantity of drugs, medications, and/or alcohol than able to be normally metabolized without experiencing these health effects

PERCEIVED SEVERITY
One’s belief in the seriousness of a specific health outcome

PERCEIVED SUSCEPTIBILITY

One's belief in the likelihood he/she will experience a specific health outcome

References

Bailey SL, Ouellet LJ, Mackesy-Amiti ME, Golub ET, Hagan H, Hudson SM, Garfein RS. Perceived risk, peer influences, and injection partner type predict receptive syringe sharing among young adult injection drug users in five U.S. cities. Drug and Alcohol Dependence. 2007; 91S:S18–S29.

Behar E, Santos GM, Wheeler E, Rowe C, Coffin PO. Brief overdose education is sufficient for naloxone distribution to opioid users. Drug and Alcohol Dependence. 2015; 148:209–212. DOI: 10.1016/j.drugalcdep.2014.12.009 [PubMed: 25595053]

Bonar EE, Rosenberg H. Using the health belief model to predict injecting drug users' intentions to employ harm reduction strategies. Addictive Behaviors. 2011; 36(11):1038–1044. DOI: 10.1016/j.addbeh.2011.06.010 [PubMed: 21763076]

Darke S, Ross J, Hall W. Overdose among heroin users in Sydney, Australia: I. Prevalence and correlates of non-fatal overdose. Addiction. 1996; 91:405–411. [PubMed: 8867202]

Doe-Simkins M, Walley AY, Epstein A, Moyer P. Saved by the nose: Bystander-administered intranasal naloxone hydrochloride for opioid overdose. American Journal of Public Health. 2009; 99:788–791. [PubMed: 19363214]

Evans JL, Tsui JI, Hahn JA, Davidson PJ, Lum PJ, Page K. Mortality among young injection drug users in San Francisco: A 10-year follow-up of the UFO study. American Journal of Epidemiology. 2012; 175:302–308. [PubMed: 22227793]

Falck RS, Siegal HA, Wang J, Carlson RG. Usefulness of the health belief model in predicting HIV needle risk practices among injection drug users. AIDS Education and Prevention. 1995; 7:523–533. [PubMed: 8924349]

Green TC, Heimer R, Grau LE. Distinguishing signs of opioid overdose and indication for naloxone: an evaluation of six overdose training and naloxone distribution programs in the United States. Addiction. 2008; 103(6):979–989. DOI: 10.1111/j.1360-0443.2008.02182.x [PubMed: 18422830]

Jamner MS, Corby NH, Wolitski RJ. Bleaching injection equipment: Influencing factors among IDUs who share. Substance Use and Misuse. 1996; 31:1973–1993. [PubMed: 8969019]

Kerr T, Fairbairn N, Tyndall M, Marsh D, Li K, Montaner J, Wood E. Predictors of non-fatal overdose among a cohort of polysubstance-using injection drug users. Drug and Alcohol Dependence. 2007; 87:39–45. [PubMed: 16959438]

Kerr T, Small W, Hyshka E, Maher L, Shannon K. 'It's more about the heroin': injection drug users' response to an overdose warning campaign in a Canadian setting. Addiction. 2013; 108(7):1270–1276. DOI: 10.1111/add.12151 [PubMed: 23551565]

McGregor C, Darke S, Ali R, Christie P. Experience of non-fatal overdose among heroin users in Adelaide, Australia: circumstances and risk perceptions. Addiction. 1998; 93(5):701–711. [PubMed: 9692269]

Powis B, Strang J, Griffiths P, Taylor C, Williamson S, Fountain J, Gossop M. Self-reported overdose among injecting drug users in London: Extent and nature of the problem. Addiction. 1999; 94:471–478. [PubMed: 10605843]

Rosenstock IM. Why people use health services. The Millbank Memorial Fund Quarterly. 1966; 44:94–127.

Seal KH, Thawley R, Gee L, Bamberger J, Kral AH, Ciccarone D, Edlin BR. Naloxone distribution and cardiopulmonary resuscitation training for injection drug users to prevent heroin overdose death: A pilot intervention study. Journal of Urban Health. 2005; 82:303–311. [PubMed: 15872192]

Sherman SG, Gann DS, Tobin KE, Latkin CA, Welsh C, Bielenson P. "The life they save may be mine": Diffusion of overdose prevention information from a city sponsored programme. International Journal of Drug Policy. 2009; 20:137–142. [PubMed: 18502635]

Vhalov D, Wang C, Ompad D, Fuller CM, Caceres W, Ouellet L, Garfein RS. Mortality risk among recent-onset injection drug users in five U.S. cities. Substance Use and Misuse. 2008; 43:413–428. [PubMed: 18365941]

Walley AY, Xuan Z, Hackman HH, Quinn E, Doe-Simkins M, Sorensen-Alawad, Ozonoff A. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. British Medical Journal. 2013; 346:f174. [PubMed: 23372174]

Warner-Smith M, Darke S, Day C. Morbidity associated with non-fatal heroin overdose. Addiction. 2002; 97:963–967. [PubMed: 12144598]

Table 1

Descriptive characteristics of sample, bivariate correlations with overdose history, negative binomial regression model

Characteristic	*N*(%) or *M* (*SD*)	Correlation with number of lifetime overdoses	Negative binomial regression Incident Rate Ratio (95% CI)[a]
Age	45.3 (11.3)	.24 *	**1.04 (1.01 – 1.07)** *
Gender		.07	
Males (coded 1) Females (coded 0)	70 (76.9%) 21 (23.1%)		0.64 (0.31 – 1.33) [reference group]
Race		−.03	
Non-Caucasian (coded 1) Caucasian (coded 0)	49 (53.8%) 42 (46.2%)		**0.36 (0.17 – 0.76)** ** [reference group]
Mean Age of IDU Initiation	24.9 (9.2)	−.35 **	**0.94 (0.90 – 0.97)** **
Mean Number of Months attending NEP	45 (51.3)	.28 **	1.05 (.97–1.13)
Mean Overdose Severity[b]	3.2 (1.1)	−.34 **	**0.57 (0.42 – 0.77)** ***
Mean Overdose Susceptibility[b]	2.4 (0.9)	.06	**1.49 (1.02–2.18)** *
Mean number of lifetime overdoses	2.9 (5.3)	–	–

[a] Model $\chi^2(7) = 36.28$ ($p < .001$). Inter-correlations among independent variables were all under 0.43 and variance inflation statistics were all under 1.5.

[b] Mean of a 5-point Likert-style scale. Higher scores indicate higher perceived severity or susceptibility.

* $p < .05$,

** $p < .01$,

*** $p < .001$