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Risk factors associated with skin and soft tissue infections among hospitalized people who inject drugs

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Abstract

Objectives—Skin and soft tissue infections (SSTIs) are common among people who inject drugs (PWID) and can lead to serious morbidity and costly emergency room and hospital utilization. A range of high-risk injection practices may contribute to these infections. The goal of the current study was to examine risk practices that were associated with SSTIs in a sample of hospitalized PWID.

Methods—PWID (N = 143; 40.6% female) were recruited from inpatient medical units at a large urban hospital and completed a baseline interview that focused on infection risk. Measures included demographics, substances used/injected, and self-report of SSTIs (i.e., abscesses, ulcers, or cellulitis) within the last year. The Bacterial Infections Risk Scale for Injectors (BIRSI), a 7-item index, assessed specific behaviors expected to increase the risk of acquiring SSTIs (e.g., injection without skin cleaning, intramuscular injection).

Results—The sample was 58% Caucasian and averaged 38.7 (SD = 10.7) years of age. Ninety-three participants (65%) reported at least one SSTI within the last year. Using a logistic regression model, the BIRSI (OR = 1.87, p = .004) and total number of injections over the last three months (OR = 2.21, p = .002) were associated with past year SSTIs.

Conclusions—In conclusion, rates of last year SSTIs were high in this sample of hospitalized PWID. Results suggest that interventions should target specific injection practices to reduce infection risk.

Keywords

skin infections; abscesses; bacterial infections; people who inject drugs; injection drug use; heroin

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Introduction

People who inject drugs (PWID) experience a wide range of negative health outcomes related to injection practices, including viral (i.e., HIV, Hepatitis C) and bacterial infections, such as skin and soft tissue infections (SSTIs; e.g., abscesses), sepsis, and endocarditis. Among these, SSTIs are common, with almost 70% of injectors reporting past SSTIs and 12–35% reporting current or recent infections (Binswanger et al., 2000; Dahlman et al., 2015; Hope et al., 2008; Morrison et al., 1997; Phillips & Stein, 2010; Smith et al., 2015). Skin infection is one of the most common reasons that PWID present to the emergency department (ED) or are admitted for inpatient hospitalization (Marks et al., 2013; Ciccarone et al., 2001; Palepu et al., 2001). PWID present for medical care more often than the general population (Kerr et al., 2005; Stein et al., 1993) and in the U.S., are more likely to be uninsured, which may indicate lower access to health care (Tookes et al., 2015). Of particular concern, inpatient hospitalization rates of opiate-related SSTIs in the U.S. have grown substantially, with a recent study showing a doubling of these rates from 1993 to 2010 (Ciccarone et al., 2016).

A range of risk factors has been shown to contribute to SSTIs in the literature. Demographic variables, such as female gender and unstable housing, have been shown to be associated with current and lifetime SSTIs (Dahlman et al., 2015; Hope et al., 2008; Lloyd-Smith et al., 2005, 2008). Women describe more problems finding veins and may be at greater risk for infections due to a range of sociocultural factors that lead to depending on others for injecting, which often involves sharing injection equipment (Darke et al., 2001; Kral et al., 1999; Smith et al., 2015; Tuchman, 2015). HIV-positive status has been examined in a range of studies, focusing on reduced immune function leading to increased bacterial infection susceptibility (Brettle, 1997; Flanigan et al., 1999; Gebo et al., 2006; Lloyd-Smith et al., 2005; Wilson et al., 2002).

When considering injection-specific risks, frequent injection has been found to predict SSTIs in a number of studies (Binswanger et al., 2000; Hope et al., 2008; Phillips & Stein, 2010). Injecting repeatedly can increase the odds of an infection, but so can the manner in which one injects. For example, reusing syringes multiple times has been associated with abscesses (Murphy et al., 2001), likely due to dull needles damaging skin tissue. Other methods of injection, such as under the skin (subcutaneous) or intramuscularly, heighten the risk of infection, presumably due to irritation to the skin itself (Binswanger et al., 2000; Murphy et al., 2001; Phillips & Stein, 2010). PWID who intend to inject into a vein, but miss, are also at risk for SSTIs. A recent study in Britain (Hope et al., 2016) found an association between the frequency of missed hits and skin problems (redness, tenderness), infections, or wounds. Booting or jacking, defined as repeatedly flushing the contents of one's syringe into the vein, has also been examined as a risk factor for abscesses (Murphy et al., 2001). Injection in particular sites, such as the groin, hands, or neck, can lead to a range of injection-related skin problems and serious medical conditions such as deep vein thrombosis and amputation (Darke et al., 2001). Lastly, shorter injection history, often defined by years of injection, appears to be associated with infection risk (Binswanger et al., 2000; Phillips et al., 2008).

A host of hygiene factors, such as not cleaning one's skin or washing hands before injecting, also add risk. Early data demonstrating that the skin flora of PWID contributes significantly to bacterial infections (Tuazon et al., 1974) has been followed by studies suggesting that skin cleaning with alcohol at the injection site reduces the odds of SSTIs (Murphy et al., 2001; Smith et al., 2015; Vlahov et al., 1992). Hand washing appears protective against skin abscesses and other injecting-related injuries and diseases (Dwyer et al., 2009). Similarly, Staphyloccus aureus (S. aureus) nasal carriage has been shown to be associated with increased risk of bacterial infections among PWID, though the data is limited (Bassetti & Battegay, 2004). Licking one's needle before using it to inject may increase the potential for bacterial contamination and has been shown to be associated with SSTIs (Binswanger et al., 2000; Deutscher & Perlman, 2008). Other hygiene factors associated with infections include reusing one's own syringe repeatedly and sharing syringes and injection equipment with other PWID (Gordon & Lowy, 2005; Hope et al., 2008; Lloyd-Smith et al., 2008). When a syringe is reused, but not cleaned, bacteria may be present and can enter the body or be passed from one individual to the next if shared (Gordon & Lowy, 2005).

Certain drugs and the source of one's drugs may be associated with SSTIs. Injection of cocaine and speedballs (mix of heroin and cocaine), likely due to their vasoconstrictive properties, can lead to tissue necrosis (Ebright & Pieper, 2002; Hope et al., 2008; Lloyd-Smith et al., 2005, 2008; Murphy et al., 2001; Phillips & Stein, 2010; Spijkerman et al., 1996). Injecting crushed pills and non-powdered drugs contribute to vein damage and abscesses (Aitken & Higgs, 2002; Dahlman et al., 2015; Dwyer et al., 2009). In the western U.S., black tar heroin has been associated with bacterial infections (Dunbar & Harruff, 2007; Passaro et al., 2008) and is often described as difficult to inject due to its thick consistency. Repeatedly injecting black tar intravenously can lead to necrosis, vascular collapse, and sclerosis, thus encouraging alternative injection methods that are risky for SSTIs (e.g., intramuscular injection; Dunbar & Harruff, 2007). Furthermore, recent data shows that cities where black tar is the dominant form of heroin (compared to powder forms) have higher rates of hospitalization for SSTIs (Ciccarone et al., 2016).

Few studies have examined a range of factors associated with bacterial SSTIs in a hospitalized PWID sample. Understanding risk factors among hospitalized PWID, a particularly high risk group, may be useful in the prevention of future infections. The goal of the current study was to evaluate factors associated with SSTIs within the last year among hospitalized PWID. We hypothesized that we would find higher rates of past year SSTIs in our hospitalized sample compared to past community samples. In addition, based on past literature, we believed that high-risk injection practices, as assessed by a brief scale, as well as injection frequency, cocaine use, alcohol misuse, severity of opiate dependence, and select demographic variables (female status, homelessness, less education) would predict skin infections contracted within the last year.

Methods

Participants and Procedures

Between January 2014 and October 2015, PWID ($N = 143$) were recruited from various inpatient medical units at an academic safety-net hospital in Boston as part of an ongoing randomized trial to teach skin-cleaning and other hygiene practices. Each morning, research staff reviewed the electronic medical records at the hospital to identify patients who appeared to have a history of illicit drug use and otherwise met eligibility criteria for the study. After obtaining permission from the inpatient clinical team, the research assistants then approached patients for recruitment. Patients were screened to determine eligibility, and those who met criteria were invited to participate.

Eligibility for the study included age 18 or older and self-report of drug injection on at least three days in the week before hospitalization. Participants were excluded if they reported current psychosis or homicidal/suicidal ideation, could not speak English or provide informed consent, were unable to provide names and contact information for at least two locator persons, or planned to move out of the Boston area in the next year. Potential participants ($n = 521$) were screened and over half ($n = 281$) did not qualify for the study. Reasons for ineligibility included: no drug injection ($n = 177$), injecting fewer than three days per week (n = 48), no contacts ($n = 27$), not being able to attend follow-ups ($n = 14$), not an English speaker ($n = 8$), suicidal/homicidal ideation ($n = 1$), and other ($n = 6$). Out of those eligible ($n = 240$), 64 did not consent to participate ($n = 30$ for refusal, $n = 12$ due to being discharged, $n = 9$ due to staff being unavailable, $n = 13$ for other reasons) and 33 consented but did not complete a baseline assessment due to a range of reasons (e.g., discharged or leaving AMA). Data on persons who refused participation in the study was limited due to restrictions from the IRB. Anecdotally, of the 30 persons who refused to participate despite being eligible, the most common reasons for non-participation included: not having enough time to participate, feeling overwhelmed, and lack of interest in participating in research. The remaining 143 participants agreed to enroll and participated in the baseline interview. Participants were hospitalized for a variety of reasons, with bacterial infections being the most common. Primary diagnoses included SSTI (abscess, cellulitis; 46.9%), sepsis (14%), overdose/withdrawal (13.3%), pneumonia (4.9%), trauma (4.2%), and other (chest pain, gastrointestinal problems, fever, asthma, pain, other; 16.8%).

Following informed consent, participants completed a structured interview that lasted approximately 60 to 90 minutes in their hospital room. Although participation continued in the study following the initial appointment, only baseline interview data were analyzed here. Compensation for participating in the study included either a $20 gift card or a pre-paid cell phone. The Boston Medical Center Institutional Review Board approved the materials and recruitment procedures.

Measures

The baseline interview included questions on demographics, including gender, age, race/ethnicity, and housing status. Education was categorized into completion of 12+ years of education (or GED) or less. HIV status was based on self-report. Drug use, injection, and last year SSTIs were based on self-report. SSTIs were defined for participants as “skin abscesses (defined as red, hard infected lumps that contain pockets of pus), ulcers (defined as open, infected sores), or cellulitis (defined as a more widespread skin infection),” using a single item assessing the number of infections that occurred within the last year. The Addition Severity Index (ASI) Drug Module (McLellan et al., 1980) was used to assess the number of days that heroin, cocaine, other opiates, and methamphetamine were used and injected in the last 90 days. Opiate dependence was assessed with the 5-item Opiate Subjective Dependence Questionnaire (OSDQ; Sutherland et al., 1986; score range = 0 – 15). The 3-item Alcohol Use Disorders Identification Test Consumption (AUDIT-C) (Bradley et al., 2007) was used to assess hazardous alcohol use. Scores range from 0 to 12 and a total score above 3 for females and over 4 for males indicates alcohol-related problems.

We adapted and shortened the Bacterial Infections Risk Scale for Injectors (BIRSI; Phillips & Stein, 2010), a 17-item scale that we had previously developed to capture a range of behaviors that, based on the literature, might place individuals at increased risk of SSTIs. We included 7 items that were dichotomized (present vs. absent) and summed to create an index of risk. These included any injection drug use without skin cleaning or hand washing, using used needles, intramuscular injection, subcutaneous injection, injection of cocaine and/or speedballs, and any visits to a shooting gallery or other place that PWID go to inject; all items used a past 3 months assessment period. Because they were conceptualized as cause or formative indicators, calculating internal consistency was not appropriate (Bollen & Bauldry, 2011).

Analytical Methods

We present descriptive statistics to summarize the background characteristics of the sample. Of primary interest, bivariate and multivariate logistic regression models were estimated to evaluate the unadjusted and adjusted associations of demographic characteristics and potential risk factors with the likelihood of last year SSTI. We present estimated odds-ratios, 95% confidence interval estimates, and tests of significance for each evaluated association. The multivariate model included all variables identified in the associated table. Secondary analyses examined the association of individual behaviors included in the BIRSI with SSTI risk (series of Pearson chi square tests) and a parallel logistic regression model examined risk factors associated with hospitalization for SSTI in the past year.

Results

Participants averaged 38.7 (± 10.7) years of age, 40.6% were female, 58.0% were non-Latino Caucasian, 21.7% were African-American, 16.8% were Latino, and 3.5% were of other racial or ethnic origins (Table 1). We compared non-Latino Caucasian participants to all racial and ethnic minorities in subsequent analyses. Eighty-three (58.1%) participants reported at least 12 years of education or GED, 80 (55.9%) persons had been homeless in the past 90 days, 15.4% self-reported as HIV+, and 37.1% screened positive for hazardous alcohol use on the AUDIT-C. Almost all participants (98.6%) reported using heroin in the past 3-months and 73.4% reported cocaine use during that same period. All participants reported injecting drugs during the past 90 days; the mean number of injections during that period was 350.7 (± 442.5, Mdn = 240, range = 14 – 3440). Because of positive skewness in this variable, we log-transformed total injections for subsequent analyses. The primary injected drug reported by participants included opiates (90.1%), cocaine (7.8%), and speedballs (1.4%). The mean age of initiating injection drug use was 26.0 (± 9.2) and the mean score on the Opiate Subjective Dependence Questionnaire (OSDQ) was 10.5 (± 3.54). On average, participants reported 4.30 (± 1.29, Mdn = 4, range 0 – 7) SSTI risk behaviors on the BIRSI (past 3 months), and 65% reported an SSTI in the past year.

Last year SSTI was not associated significantly with age, gender, race/ethnicity, educational attainment, recent homelessness, HIV+ self-report, screening positive for hazardous alcohol use, recent cocaine use, severity of opiate dependence, and the age at which persons initiated injection (Table 2). The unadjusted and adjusted associations of SSTI with total number of injections, higher education, and the BIRSI were statistically significant. Adjusting for covariates, the estimated adjusted odds of SSTI increased by a factor of 2.21 (95% CI 1.35; 3.62, p = .002) for a one unit increase in log transformed total injection frequency. A one unit increase in the number of risk behaviors reported on the BIRSI was associated with a 1.87 (1.22; 2.85, p = .004) fold increase in the odds of SSTIs. Higher education was also associated significantly with an increased risk of SSTI. Controlling for other covariates in the multivariate model, the odds of SSTI was 4.81 (1.89; 12.3, p = .001) times higher for persons with 12+ years than for those who had not completed high school. The unadjusted associations, also presented in Table 2, give a similar pattern of associations.

Because the severity of SSTI among persons reporting a past-year SSTI may be heterogeneous, we conducted a “sensitivity analysis” using a parallel logistic regression model examining risk factors (same variables as reported in Table 2) associated with one or more hospitalizations for SSTIs within the last year (n = 75). The likelihood of being hospitalized for an SSTI was significantly higher (OR = 2.51, 95% CI 1.09; 5.75, p = .031) among persons with 12+ years of education than among persons not completing high school, significantly higher as the log of total injections increased (OR = 2.21, 95% CI 1.39; 3.52, p = .001), and significantly higher as the number of risk behaviors included in the BIRSI increased (OR = 1.50, 95% CI 1.02; 2.20, p = .037). The likelihood of reporting a hospitalization for SSTI was not associated with other covariates included in the model.

Additionally, we conducted an auxiliary analysis (series of Pearson chi square analyses) exploring the association of individual behaviors included in the BIRSI with last year SSTI (Table 3). Most participants said they had injected without cleaning their skin (93.0%) or washing their hands (89.5%). Most (86.7%) also said they had not always used cleaned needles. About 58.7% said they had injected under their skin, 14.7% had injected into muscles, 58.0% had injected cocaine or speedballs, and 29.4% had visited a shooting gallery. At the conventionally accepted .05 level, SSTI was associated significantly only with injecting under one’s skin ($\chi 2 = 13.64$, $p < .001$). Substantively higher rates of SSTI were observed for all other risk behaviors included in the current BIRSI, though any association with using uncleaned needles is substantively weak.

Discussion

As expected, findings from this study with hospitalized PWID, a particularly high-risk group, demonstrate that SSTIs were common, with 65% of all participants reporting one or more infections over the last year. These rates are about twice as high as those reported in past studies examining past year SSTIs (Dahlman et al., 2015; Hope et al., 2008), though our rates are likely higher due to recruitment of PWID in the hospital setting. With this in mind, generalizability to non-hospital samples is limited. Frequent injection, higher education, and risky injection practices, as measured by the 7-item BIRSI, were the primary contributors of SSTIs, which cause significant morbidity and drive health care costs for PWID (Tookes et al., 2015).

The BIRSI assesses a range of behavioral risk factors for acquiring SSTIs and was developed to capture some of the most common factors reported in the literature on SSTIs among PWID, such as injecting without skin cleaning, using used needles, and injecting intramuscularly (Binswanger et al., 2000; Gordon & Lowy, 2005; Murphy et al., 2001; Phillips & Stein, 2010; Smith et al., 2015). If confirmed in a prospective study, the BIRSI index may represent a new brief instrument for predicting risk of SSTIs, a major contributor to the morbidity of PWID. In this cohort there was wide variability in injection practices. For instance, 58.0% injected cocaine or speedballs and 14.7% performed intramuscular injection. As our index indicates, a combination of factors contributes to greater risk for individuals. The development of a brief measure such as the BIRSI to assess SSTI risk might be useful to community-based organizations for intervention purposes. Since we believe that the BIRSI items should be conceptualized as formative rather than reflective indicators, commonly used psychometric analytic techniques weren't appropriate to use here. Regardless, we believe that a separate study that empirically evaluates the BIRSI with an independent sample is warranted and should be pursued in future work.

Total number of injections over the last three months was significantly associated with SSTIs, both in our primary as well as our secondary sensitivity analysis. This confirms what we reported more than a decade ago (Stein & Anderson, 2003), and is most likely explained by increased opportunity for infection when injecting repeatedly. Without careful skin cleaning, every injection may introduce bacteria sub-dermally. This association could also be a reflection of addiction severity, environmental circumstances, fatalism and careless or rushed injection practices that have been associated with high numbers of daily injections (Lloyd-Smith et al., 2009; Rachlis et al., 2010).

We did not find that past year SSTIs were more common among women, individuals who reported HIV+ status, or those who were recently homeless. Past studies have suggested that women may be at greater risk due to problems finding veins or being injected by romantic partners (Dahlman et al., 2015; Hope et al., 2008). Similarly, it has been reported that HIV+ status contributes to greater risk for bacterial SSTIs (Lloyd-Smith et al., 2005), but we did not confirm this here. HIV status was assessed via self-report in our study and may be an underestimate of HIV status, thus impacting our findings. We speculate (but do not have data to confirm) that use of antiretroviral therapy by self-reported seropositive persons may preserve immune functioning. Unexpectedly, higher education was associated with SSTIs in our adjusted model and in the sensitivity analysis. We cannot easily explain this association; it is possible that overall education may not protect individuals from SSTIs, but this needs to be further explored.

There are a number of limitations to the current study. First, we based past report of SSTI on self-report. However, PWID have been found to be accurate reporters of injection-related problems such as abscesses (Morrison et al., 1997), and we offered explicit definitions of SSTIs as part of our survey. Second, it is possible that recruiting hospitalized PWID may have introduced bias into the study and contributed to our findings on rates of SSTIs. It is possible that PWID with a diagnosis of an SSTI are more likely to present for hospitalization and persons with these diagnoses may have been more likely to self-select into our study. Importantly, participants in the current study agreed to enroll in an RCT at a large, urban hospital, which may have contributed to a different subgroup of PWID. Reasons for hospitalization among PWID in our sample could be different from participants at other hospitals in other geographic regions, thus limiting generalizability. When examining anedoctal reasons for not participating, the most common reasons included limited time, feeling overwhelmed, and lack of interest. Unfortunately, due to IRB restrictions, we were unable to systematically assess reasons for participation refusal among non-enrolled participants. Speculating about whether such reasons were related to infection or infection risk is beyond the scope of our available data. However, it is possible that reasons for non-participation may differ at other study sites and could contribute to different rates of SSTI. Lastly, due to time limits for our baseline assessment, we did not assess a number of other variables that have been found to be associated with SSTIs, such as injection of non-powdered drugs, which might have influenced the current findings.

Conclusions

In summary, findings from the current study suggest that a substantial number of hospitalized PWID experience SSTIs. Consistent with the small body of past work on this topic, our index of high-risk injection practices (BIRSI) and frequent injection were associated with SSTIs. Reduction of behavioral risk factors as elucidated by the BIRSI may be particularly challenging within the context of the larger risk environment that many PWID experience (Rhodes, 2002; Rhodes, 2009). Regardless, educating PWID about the high-risk practices identified in the BIRSI should be considered as part of any behavioral intervention. Hospitalized PWID in this study have enrolled in a large RCT focused on reducing high-risk injection practices through psychoeducation, skills training, and motivational interviewing using a two-session intervention and many are expected to continue injecting (Phillips et al., 2012). Similar recent interventions have shown positive results related to reduced injection-site complications (Roux et al., 2016). Despite such interventions, certain aspects of the risk environment (Rhodes, 2009), such as the social environment of PWID (e.g., interpersonal influences on injection, stigma) and economic/ policy constraints (e.g., lack of needle exchange or syringe access through the pharmacy, limited access to health care and housing), may affect the success of any intervention if drug injection continues. Creating better access to risk reduction programs as well as improving the social conditions of PWID (Rhodes, 2009) is key. Additionally, opportunistic linkage of persons who use opioids to long-term medication treatment at the time of hospitalization is critical and has recently been shown to be feasible and promising (Liebschutz et al., 2014). Just as medication treatments such methadone or buprenorphine serve as prevention for HIV infection (Karki, Shrestha, Huedo-Medina, & Copenhaver, 2016), such treatments, if maintained, may reduce SSTIs as well (Stein & Anderson, 2003). Without such treatments, the high financial and personal costs associated with these infections will continue (Tookes et al., 2015).

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Table 1

Background Characteristics (N = 143).

	n (%)	Mean (± SD)	Median	Range
Years Age		38.7 (± 10.7)	36	19 – 62
Female	58 (40.6%)			
Race/Ethnicity				
Non-Latino Caucasian	83 (58.0%)			
African-American	31 (21.7%)			
Latino	24 (16.8%)			
Other	5 (3.5%)			
Education (≥ 12 Years)	83 (58.1%)			
Homelessness	80 (55.9%)			
HIV+	22 (15.4%)			
AUDIT-C Positive	53 (37.1%)			
Heroin Use (Past 90 Days)	141 (98.6%)			
Cocaine Use (Past 90 Days)	105 (73.4%)			
Opiate Dependence (OSDQ)		10.5 (± 3.54)	11	0 – 15
Days Heroin Non-Injection (0–90 days)		22.02 (± 7.87)	21	0 – 47
Age Initiated Injection Drug Use		26.0 (± 9.2)	24	11 – 52
Days Heroin Injected (0–90 days)		58.14 (± 28.22)	68	0 – 90
Days Cocaine Injected (0–90 days)		15.2 (± 25.9)	2	0 – 90
Days Other Opiates Injected (0–90 days)		0.41 (± 2.11)	0	0 – 18
Days Meth Injected (0–90 days)		0.76 (± 4.56)	0	0 – 45
Total # Injections (Past 90 Days)		350.7 (± 442.5)	240	14 – 3440
Primary Injected Drug				
Opiates	130 (90.1%)			
Cocaine	11 (7.8%)			
Speedballs	2 (1.4%)			
BIRSI		4.30 (± 1.29)	4	0 – 7
Any SSTI (Past Year)	93 (65.0%)			

Table 2

Unadjusted and Adjusted Odds Ratios Estimating the Associations of Background Characteristics with Self-Reported SSTI (N = 143).

	Unadjusted		Adjusted	
	OR (95% CI)	**z (p =)**	**OR (95% CI)**	**z (p =)**
Years Age	0.99 (0.96; 1.03)	−0.30 (.763)	1.03 (0.97; 1.08)	0.89 (.374)
Female	0.80 (0.40; 1.62)	−0.61 (.539)	0.77 (0.29; 2.05)	−0.52 (.606)
Non-Latino Caucasian	1.29 (0.64; 2.58)	0.72 (.473)	0.97 (0.39; 2.41)	−0.06 (.953)
Education (HS+)	2.43 (1.20; 4.90)	2.47 (.014)	4.81 (1.89; 12.3)	3.29 (.001)
Homelessness (Past 90 Days)	0.78 (0.39; 1.56)	−0.72 (.474)	0.52 (0.22; 1.27)	−1.43 (.153)
HIV+	0.74 (0.29; 1.88)	−0.63 (.526)	0.87 (0.22; 1.27)	−0.19 (.847)
AUDIT-C Positive	0.72 (0.36; 1.47)	−0.89 (.371)	0.47 (0.19; 1.17)	−1.62 (.104)
Cocaine Use (Past 90 Days)	1.77 (0.83; 3.78)	1.47 (.143)	1.39 (0.50; 3.91)	0.63 (.529)
Opiate Dependence Severity[a]	0.98 (0.69; 1.38)	−0.13 (.898)	0.87 (0.56; 1.37)	−0.59 (.556)
Age Initiated Drug Injection	0.99 (0.96; 1.03)	−0.32 (.747)	1.00 (0.95; 1.05)	0.02 (.985)
Total # Injections (Past 90 Days)[b]	2.46 (1.62; 3.73)	4.25 (<.001)	2.21 (1.35; 3.62)	3.15 (.002)
BIRSI	1.71 (1.26; 2.31)	3.49 (<.001)	1.87 (1.22; 2.85)	2.88 (.004)

[a] Standardized to 0 mean and unit variance. The associated coefficients give the expected change in the odds of SSTI for a 1 SD increase opiate dependence severity.

[b] Log transformed.

Table 3

SSTI by Each Indicator Included in the 7-item BIRSI.

		SSTI		
	Total (N =143)	No (n = 50)	Yes (n = 93)	χ2 (p =)
Not Cleaned Skin				
No	10 (7.0%)	6 (12.0%)	4 (4.3%)	2.96 (.085)
Yes	133 (93.0%)	44 (88.0%)	89 (95.7%)	
Not Washed Hands				
No	15 (10.5%)	8 (16.0%)	7 (7.5%)	2.49 (.115)
Ye	128 (89.5%)	42 (84.0%)	86 (92.5%)	
Injected Under Skin				
No	59 (41.3%)	31 (62.0%)	28 (30.1%)	13.64 (<.001)
Yes	84 (58.7%)	19 (38.0%)	65 (69.9%)	
Injected Into Muscle				
No	122 (85.3%)	45 (90.0%)	77 (82.8%)	1.35 (.246)
Yes	21 (14.7%)	5 (10.0%)	16 (17.2%)	
Used Uncleaned Needles				
No	19 (13.3%)	7 (14.0%)	12 (12.9%)	0.03 (.854)
Yes	124 (86.7%)	43 (86.0%)	81 (87.1%)	
Injected Cocaine/Speedballs				
No	60 (42.0%)	25 (50.0%)	35 (37.6%)	2.04 (.153)
Yes	83 (58.0%)	25 (50.0%)	58 (62.4%)	
Visited Shooting Gallery				
No	101 (70.6%)	40 (80.0%)	61 (65.6%)	3.25 (.071)
Yes	42 (29.4%)	10 (20.0%)	32 (34.4%)	