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Pre- and Postinjury Substance Misuse Among Veterans With Spinal Cord Injury

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Objective: To identify rates of substance misuse with onset before and after spinal cord injury (SCI) and to investigate whether patients with a history of substance misuse are more likely to report being intoxicated at the time of injury. ***Participants:*** One hundred twenty-four veterans with traumatic SCIs. ***Measures:*** Alcohol and nonalcohol psychoactive substance use disorder (PSUD) sections of the Structured Clinical Interview for *DSM–III–R*. ***Results:*** Forty (32%) had a lifetime PSUD. Of those, 55% recalled the onset of their PSUD occurring preinjury, 27.5% recalled the onset occurring postinjury, and 17.5% could not recall their age at onset. Compared with participants who reported postinjury onset of PSUD, those with reported preinjury onset were more likely to report intoxication at time of injury. No significant relation was found between intoxication at injury and presence of a lifetime PSUD. ***Conclusion:*** Intoxication at injury does not necessarily substantiate the existence of an underlying substance misuse problem.

The pervasiveness of substance misuse[1] among persons with spinal cord injury (SCI) is an escalating source of concern within the disciplines of medical and psychological rehabilitation. The number of people in the United States who are currently living with SCI has been estimated to be between 183,000 and 230,000, with approximately 11,000 new cases reported each year (Go, DeVivo, & Richards, 1995). Individuals with SCI who have developed or sustained a chemical addiction clearly have their problems compounded (Radnitz & Tirch, 1995). Substance misuse has been identified as a predominant risk factor for injury onset and is believed to impede the rehabilitation process by impairing learning and increasing morbidity (Heinemann, Doll, Armstrong, Schnoll, & Yarkony, 1991; Heinemann, Doll, & Schnoll, 1989). It has also been associated with higher levels of depression, life stress, and poorer health among persons with SCI. Furthermore, research suggests that persons with substance misuse problems have more psychological difficulties following their return to the community (Tate, 1993; Young, Rintala, Rossi, Hart, & Fuhrer, 1995). Studies of the extent of substance misuse in persons with SCI have examined levels of intoxication at the time of SCI as well as patterns of misuse onset before and after injury.

There has been extensive research evaluating the rates of substance intoxication during the occurrence of traumatic injury. Many studies have used analysis of blood alcohol level (BAL) at time of hospital admission, and these investigations have revealed a strong relation between substance misuse and risk for traumatic injury. Estimates range from 16% to 45% of persons with SCI who have sustained alcohol-related injuries (Bombardier & Rimmele, 1998; Frisbie & Tun, 1984; Fullerton, Harvey, Klein, & Howell, 1981; Galbraith, Murray, Patel, & Knill-Jones, 1976; Gale, Dikmen, Wyler, Temkin, & McLean, 1983; Heinemann, Doll, & Schnoll, 1989). Other studies, measuring the combined rates of alcohol and drugs, have suggested a stronger relationship, with 39%–68% of persons testing positive when their injuries occurred (Heinemann, Mamott, & Schnoll, 1990; Heinemann, Schnoll, Brandt, Maltz, & Keen, 1988; McKinley, Kolakowsky, & Kreutzer, 1999; O'Donnell, Cooper, Gessner, Sheehan, & Ashley, 1981/1982; Tate, 1993). A recent general trauma study reported that 35.8% of 2,657 patients were "intoxicated" (e.g., BAL $\geq$ 100 mg/dL) on admission to the emergency department (Rivara et al., 1993). Further investigation into the connection between intoxication and serious injury has led researchers to identify such patients as having substantial preinjury alcohol consumption histories and, more importantly, as being at risk for poorer rehabilitation outcomes (Frisbie & Tun, 1984).

Fewer studies have examined patterns of substance misuse with onset prior to SCI, and a majority relied exclusively on indices of self-reported alcohol consumption as the primary method of assessment. For example, Frisbie and Tun (1984) reported that 67% of 137 patients with SCI were found to be habitual drinkers (i.e., consumed an average of six drinks per day) before injury. Similar results were reported by Heinemann, Doll, and Schnoll (1989),

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[1] The definitions used throughout the existing literature to classify the extent of substance misuse among individuals with SCI have been generally inconsistent. Throughout this article and with regard to reviewing the existing literature, persons with substance abuse and dependence diagnoses are frequently referred to collectively with the term *misuse*, encompassing both conditions.

who found an onset of drinking problems (i.e., five alcohol drinks per drinking occasion on three to six occasions per week) prior to injury in 65% of his sample with SCI, and Kolakowsky-Hayner et al. (1999), who found that 57% of 26 patients with SCI were heavy drinkers (i.e., greatest quantity and frequency of alcoholic beverages consumed on a Quantity–Frequency–Variability Index scale) before their injury. Other studies that used brief screening devices to detect potential alcohol abuse have reported lower percentages of preinjury substance misuse, with indices of potential preinjury alcohol abuse among SCI patients ranging from 24%–49% (Bombardier & Rimmele, 1998; Heinemann, Keen, Donohue, & Schnoll, 1988; Kirubakaran, Kumar, Powell, Tyler, & Armatas, 1986; Tate, 1993). A more recent study on alcohol and drug misuse among general trauma patients found that 24.1% of 1,118 participants were alcohol dependent and 17.7% were drug dependent at the time of their injury (Soderstrom et al., 1997).

An even smaller number of studies have examined patterns of substance misuse with onset after SCI. Similar to the investigations done on preinjury misuse, all of the studies of individuals with misuse onset post-SCI have examined alcohol consumption. For example, Heinemann, Doll, and Schnoll (1989) reported that 6% of a 75-person sample experienced onset of drinking problems after SCI. Frisbie and Tun (1984) found comparable rates, with 5% of their sample becoming habitual drinkers after injury. A more recent study of alcohol and drug misuse among patients with traumatic brain injury (TBI) found that 12% of 100 participants met criteria for postinjury onset of a psychoactive substance use disorder (PSUD; Hibbard, Uysal, Kepler, Bogdany, & Silver, 1998).

Although some studies have examined the incidence of alcohol dependence and other PSUDs among general trauma patients (Rivara et al., 1993; Soderstrom et al., 1997), there is a paucity of research examining the chronological relation between sustaining an SCI and onset of a PSUD. Persons whose substance misuse predates their disability may have a different pattern of use than those whose substance misuse arises after their disability (Moore & Polsgrove, 1991), and whether misuse onset occurs before or after injury may have different implications for the rehabilitation process. Research has demonstrated that information regarding preinjury substance misuse can help identify persons at risk for postinjury abuse (Heinemann, Goranson, Ginsburg, & Schnoll, 1989). Heinemann et al. (1991) suggested that an especially crucial time for evaluation occurs during the first few years after the occurrence of an SCI. Such postinjury diagnosis is vital for the reason that, in some people, substance misuse develops as a method for coping with the losses experienced as a result of SCI (Bozzacco, 1990). It is also imperative that we identify persons who are misusing substances other than alcohol. For example, Soderstrom et al. (1997) found that lifetime drug dependence was diagnosed in 28% of 1,118 trauma patients, of whom 58% had two or more drug problems.

The principle goals of the present investigation were to identify the rates of PSUDs with onset before and after SCI and to replicate and extend earlier findings that patients with a history of substance misuse are more likely to report being intoxicated at the time of injury.

Method

Participants

Participants were 124 veterans with traumatic SCIs recruited from both inpatients ($n = 47$) and outpatients ($n = 77$) receiving medical care from SCI services at the Department of Veterans Affairs Medical Centers (DVAMCs) in the Bronx, New York; Castle Point, New York; and East Orange, New Jersey. Although these DVAMCs are all located in the northeastern United States, they serve an ethnically diverse population encompassing urban, suburban, and rural regions. Participants were sampled proportionally according to whether they were inpatients or outpatients so that the more easily available inpatients were not oversampled. Because outpatients were more difficult to recruit, any who passed the Mini-Mental Status Examination (MMSE; Folstein, Folstein, & McHugh, 1975), who had an SCI, and who were willing to participate were included in the study. At the time of recruitment at each DVAMC, a randomization procedure was used to determine the order in which inpatients hospitalized for medical care were approached.

Patients who agreed to participate ($N = 137$) were administered the MMSE. Of these, 13 scored below 23 and were excluded. Of the 124 veterans who were included in this study, 40 were diagnosed with a PSUD. Specific demographic characteristics may be found in Table 1. All were men, with an average age of 46.1 years ($SD = 9.7$). Their injuries occurred as a result of motor vehicle accidents (35%), falls (25%), violence (20%), sports accidents (12.5%), medical–surgical procedures (2.5%), and "other" (5%). The majority (68%) served in a war zone in either combat or noncombat roles.

Materials

Personal history form. The personal history form was used to gather demographics, military history, and data related to the occurrence of trauma. Participants were also asked a yes–no question regarding intoxication at the time of SCI. Intoxication, in this study, is defined as the self-reported use of alcohol or drugs at the time of injury. Although constructed as a questionnaire, for those participants who could not write, it was administered as an interview.

MMSE. The MMSE was administered to screen for problems in attention and to detect impairments in understanding questions and processing information (Folstein et al., 1975). The MMSE measures orientation, attention/concentration, and immediate recall. The three-stage hand movement command was altered because many of the participants with quadriplegia were incapable of performing it. The command, "take the straw in your mouth, make it point up and down, and blow through it," was substituted for, "take the paper in your right hand and fold it in half and put it on the floor." The sections requiring participants to write and draw were eliminated, and, accordingly, the cutoff score was adjusted from 25 to 23. All persons scoring below 23 were excluded from the study.

Structured Clinical Interview for DSM–III–R, Patient Edition (SCID). The SCID is a structured clinical interview used to diagnose psychiatric syndromes according to criteria listed in the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.; *DSM–III–R*; American Psychiatric Association, 1987; Spitzer, Williams, Gibbon, & First, 1990). Current and lifetime diagnoses of mood disorders, psychotic disorders, PSUDs, anxiety disorders, somatoform disorders, and adjustment disorders can be obtained using the SCID. Symptoms had to be rated at the threshold level (denoting dependence) or the subthreshold level (denoting abuse) to be considered positive (Spitzer et al., 1990). We used the SCID to determine current and lifetime rates of psychoactive substance abuse and dependence using both alcohol and nonalcohol (drug) sections of the measure. Participants were considered to have a lifetime PSUD if they if they met the *DSM–III–R* diagnostic criteria for abuse or dependence at some time in

Table 1
Demographic Characteristics by Report of a Lifetime Substance Misuse Disorder

Characteristic	Reported a lifetime substance misuse disorder		Did not report a lifetime substance misuse disorder	
Age at injury (years)				
M	28.9		29.2	
SD	9.4		13.4	
Range	18–61		18–71	
Injury duration (years)				
M	17.0		20.0	
SD	11.7		13.7	
Range	1–51		1–52	
	n	%	*n*	%
Ethnicity				
Caucasian	27	67.5	48	57.0
African American	11	27.5	31	37.0
Latino	2	5.0	5	6.0
Religion				
Catholic	17	42.5	36	43.0
Protestant	14	35.0	37	44.0
Jewish	2	5.0	1	1.0
Muslim	1	2.5	1	1.0
Buddhist	1	2.5	3	4.0
Atheist-agnostic	3	7.5	6	7.0
Other	2	5.0	0	0
Marital status				
Single	9	22.5	25	30.0
Married	11	27.5	36	43.0
Divorced-separated	20	50.0	19	23.0
Widowed	0	0	4	4.0
Branch of military				
Army	18	45.0	43	51.0
Navy	14	35.0	13	15.0
Air Force	5	12.5	14	17.0
Marines	3	7.5	14	17.0
Level of injury				
Paraplegia	23	57.5	50	59.5
Quadriplegia	17	42.5	34	40.5

Note. Forty participants reported a lifetime substance misuse disorder; 84 participants did not report a lifetime substance misuse disorder.

their life, regardless of how long ago they stopped misusing. Of those with a lifetime PSUD, participants were considered current if they met the criteria for abuse or dependence in the month prior to the interview (past month). Persons who met criteria for dependence or abuse of any substance (alcohol, cannabis, amphetamines, sedatives–hypnotics–anxiolytics, opiates, cocaine, hallucinogens, and/or phencyclidine) were identified as substance misusers. Substance misusing participants were queried to determine their age at onset of substance abuse or dependence. These data were compared with information pertaining to the date of injury to determine whether onset of misuse occurred before or after the SCI.

In a rigorous test–retest reliability study, the SCID was shown to be reliable (Williams et al., 1992), with an overall weighted kappa of .61 for current disorders and .68 for lifetime disorders. These estimates are comparable with those obtained for other diagnostic instruments.

Procedure

Research assistants were six doctoral students and two advanced master's students who had clinical coursework and some clinical experience and were trained to administer the SCID. The following four steps were involved in the training:

1. Watched SCID training tapes,
2. Observed someone experienced in the administration of this instrument conducting two interviews using the SCID,
3. Used each other as role-play partners and practiced administering the SCID, and
4. On two occasions were observed conducting interviews.

For current and lifetime PSUD diagnoses made using the SCID, observations of 10 interviews yielded diagnostic agreement in all cases.

Once this study received approval from the Institutional Review Boards (responsible for the protection of human participants) at the three DVAMCs, research assistants approached potential participants and asked whether they would be willing to be included in a study lasting approximately 1 to 2 hr that assessed the impact of trauma on patients with SCI. The consent form was shown, rights were explained, and those who agreed to participate signed the form. The first instrument administered was the MMSE, and participants scoring in the grossly impaired range (< 23) were excluded from the study. Participants completed the personal history form, and the SCID was used to interview those who were not excluded from the study. Data were collected over an 18-month period, from September 1993 through March 1995.

Results

Among 124 veterans with SCI, 40 (32%) were diagnosed with a lifetime PSUD and identified as substance misusers. Of those, 22 (55%), 17.7% overall, recalled the onset of their substance misuse occurring prior to their injury; 11 (27.5%), 8.9% overall, recalled the onset occurring after injury; and 7 (17.5%), 5.6% overall, could not recall their age at onset of substance misuse.

Of the 22 individuals who recalled their substance misuse problem beginning before their injury, 19 (86.3%) met lifetime symptomatic diagnostic criteria for an alcohol PSUD and 9 (41%) met lifetime symptomatic diagnostic criteria for a nonalcohol PSUD. Of the 11 individuals who recalled their substance misuse problem beginning after their injury, all met lifetime symptomatic diagnostic criteria for an alcohol PSUD and 5 (45.5%) met lifetime symptomatic diagnostic criteria for a nonalcohol PSUD. Table 2

Table 2
Rates of Abuse and Dependence for Alcohol and Nonalcohol Psychoactive Substance Use Disorders by Participants Reporting Onset of Substance Misuse Before and After Spinal Cord Injury (SCI)

	Lifetime		Current		Onset before SCI		Onset after SCI	
Diagnosis	*n*	%	*n*	%	*n*	%	*n*	%
Alcohol abuse	3	8	0	0	2	5	1	3
Alcohol dependence	32	80	2	5	17	43	10	25
Drug abuse	6	15	0	0	5	13	1	3
Drug dependence	12	30	4	10	4	10	4	10

Note. Forty participants reported a lifetime substance misuse disorder.

provides the rates of abuse and dependence on the basis of whether onset was recalled as occurring pre- or post-SCI.

Of 124 participants, 6 (approximately 5%) were diagnosed with current (alcohol or nonalcohol abuse or dependence in the past month) PSUDs. Of 22 substance misusers who recalled a preinjury PSUD onset, 1 (4.5%) reported symptoms consistent with a diagnosis of a current disorder. Of 11 substance misusers who recalled a postinjury PSUD onset, 2 (18%) were identified as current (one met criteria for alcohol dependence and one for nonalcohol dependence in the past month). Of 7 substance misusers who could not recall their age at onset of their PSUD, 3 (43%) were classified as current (1 met criteria for alcohol dependence and 2 for nonalcohol dependence in the past month). Table 3 provides rates of abuse and dependence by drug type among those who recalled onset of their nonalcohol PSUD before versus after SCI.

In an effort to determine whether having at least one lifetime PSUD diagnosis was related to injury severity or other demographic variables, we conducted chi-square analyses and *t* tests. We found no significant differences between groups for the variables age, $t(121) = -1.43$, $p = .16$; age at the time of injury, $t(116) = -0.06$, $p = .95$; ethnicity, $\chi^2(2, N = 124) = 0.97$, $p = .61$; religion, $\chi^2(6, N = 124) = 6.74$, $p = .34$; branch of the military, $\chi^2(3, N = 123) = 6.72$, $p = .08$; and level of SCI, $\chi^2(1, N = 122) = 0.12$, $p = .84$. Only the demographic variable of marital status was a significant confound, $\chi^2(3, N = 124) = 10.57$, $p = .01$. Follow-up analysis revealed that divorced–separated participants were significantly more likely to have a lifetime PSUD compared with those who were single ($p = .035$, two-sided Fisher's exact test) or married ($p = .013$, two-sided Fisher's exact test) but not widowed ($p = .111$, two-sided Fisher's exact test).

Regarding the rates of substance intoxication during the traumatic event that caused their injury, 28 out of 124 participants (23%) reported being intoxicated (using alcohol or drugs) at the time of their injury. Of these, 16 individuals reported a lifetime PSUD and 12 did not . Results of a Fisher's exact test conducted to assess the relationship between intoxication at injury and lifetime presence of a substance misuse disorder were not significant ($p = .178$, two-sided Fisher's exact test), suggesting that intoxication at injury does not necessarily substantiate the existence of an underlying substance misuse problem. Of those reporting intoxication at injury, 10 (36%) recalled onset of a psychoactive substance misuse disorder prior to SCI and 1 (approximately 4%) recalled onset of a substance misuse disorder after injury. Of those who did not report being intoxicated at injury ($n = 96$), 12 (12.5%) recalled onset of a psychoactive substance misuse disorder prior to SCI and 10 (approximately 10%) recalled onset of a substance misuse disorder after their injury. Results of a Fisher's exact test conducted to assess the relation between intoxication at injury and pre- or postinjury onset of misuse in those with lifetime PSUD diagnoses revealed significant between-groups differences ($p = .054$, two-sided Fisher's exact test), suggesting that a preinjury onset of substance misuse increases the likelihood that a participant will be intoxicated at the time of SCI. To ensure that this significant difference was not due to the confounding variable of marital status, we performed another chi-square to determine whether marital status was related to intoxication at injury, with a nonsignificant result: $\chi^2(3, N = 124) = 0.31$, $p = .58$.

Discussion

The onset of substance misuse among persons with SCI is often undetected, undocumented, and untreated (Tate, 1993). Increasingly, researchers and clinicians recognize the importance of classifying patients according to the pre- or postinjury onset of their substance misuse (Greer, 1986). However, there continues to be little research reporting such onset classifications, with most studies categorizing participants according to frequency of alcoholic beverages consumed.

The present study investigated the instances in which onset of substance misuse was reported to have been before or after SCI. Among 124 veterans with SCI, 40 (32%) were diagnosed with a lifetime PSUD and identified as substance misusers. Only the demographic variable of marital status was related to the presence of a lifetime PSUD, suggesting that divorced–separated individuals with SCI are more likely to have substance misuse problems. In regard to the timing of substance misuse, 22 (17.7%) of 124 participants reported onset prior to their injury. These findings differ from those of studies relying on reports of alcohol consump-

Table 3
Rates of Abuse and Dependence by Drug Type Among Those Who Recalled Onset of Their Nonalcohol Psychoactive Substance Use Disorder Before and After Injury

	Onset of misuse before SCI				Onset of misuse after SCI			
	Dependence		Abuse		Dependence		Abuse	
Drug type	*n*	%	*n*	%	*n*	%	*n*	%
Sed/hyp/anx	0	0	0	0	0	0	0	0
Cannabis	4	33	2	25	2	50	1	100
Stimulant	1	8	1	13	0	0	0	0
Opioid	2	17	2	25	0	0	0	0
Cocaine	3	25	2	25	1	25	0	0
Hall/PCP	0	0	1	13	0	0	0	0
Poly drug	2	17	0	0	1	25	0	0
Other	0	0	0	0	0	0	0	0

Note. Percentages are given in terms of all drug types for each category. SCI = spinal cord injury; Sed/hyp/anx = sedatives–hypnotics–anxiolytics; Hall = hallucinogens; PCP = phencyclidine.

tion in which substance misuse before injury occurred in 57%–67% of participants with SCI (Frisbie & Tun, 1984; Heinemann, Doll, & Schnoll, 1989; Kolakowski-Hayner et al., 1999). These findings are more comparable with studies that used brief screening devices to detect potential alcohol abuse in which substance misuse before injury was found in 24%–49% of participants with SCI (Bombardier & Rimmele, 1998; Heinemann, Keen, et al., 1988; Kirubakaran et al., 1986; Tate, 1993).

The above noted discrepant findings between our study and those of other investigators could be attributed to the distinct classification systems used to categorize individuals as substance misusers. Whereas previous SCI studies have relied on brief screening devices or self-reports of quantity and frequency of alcoholic beverages consumed, the present study used a structured clinical interview (the SCID) to determine rates of current and lifetime psychoactive substance abuse or dependence. That we found a much lower rate of diagnosable substance misuse with recalled preinjury onset underscores the importance of considering the methodology used when determining whether someone has a significant problem.

In reference to substance misuse onset after SCI, results from the present investigation are somewhat similar to those of other SCI studies. We reported that 11 (8.9%) of 124 participants recalled the onset of a PSUD after their injury had occurred. Rates of substance misuse onset after injury in other studies have ranged from 5%–6% for SCI (Frisbie & Tun, 1984; Heinemann, Doll, & Schnoll, 1989) to 12% for TBI (Hibbard et al., 1998).

Our finding that approximately 5% of 124 participants were diagnosed with current PSUDs is similar to the percentages found in other studies. For example, Hibbard et al. (1998) also found that 5% of participants with TBIs met criteria for a current PSUD, and Soderstrom et al. (1997) found that the rate of current alcohol and drug dependence for their sample of trauma center patients was 8.3%. It is, however, important to note that some veterans with SCI seeking treatment at a medical center may be unwilling to admit to current substance abuse or dependence.

Our results are similar to those of other studies that suggest that a significant number of people are intoxicated at the time of injury. For example, the current results indicated that 28 (23%) of 124 participants reported being intoxicated at the time of their injury; rates in other SCI studies have ranged from 16%–68% (Bombardier & Rimmele, 1998; Frisbie & Tun, 1984; Fullerton et al., 1981; Galbraith et al., 1976; Gale et al., 1983; Heinemann, Doll, & Schnoll, 1989; Heinemann et al., 1990; Heinemann, Schnoll, et al., 1988; McKinley et al., 1999; O'Donnell et al., 1981/1982; Tate, 1993). Regarding the connection between substance misuse and injury onset, 10 (36%) of those reporting intoxication at injury recalled onset of their substance misuse disorder occurring prior to SCI. These findings further suggest that because 18 (64%) of those reporting intoxication at injury did not recall a substance misuse disorder prior to their injury, reports of intoxication at injury should not be interpreted as indication of a preexisting substance misuse problem.

The findings of this study have several implications for treatment programs and rehabilitation outcomes. First, we did not find a significant association between intoxication at injury and the presence of a lifetime PSUD. Consequently, clinicians who identify patients as substance misusers solely on the basis of their intoxication status at injury run a substantial risk of error. Conversely, considering the absence of intoxication at injury as evidence of absence of lifetime PSUD may be equally incorrect. What these findings suggest is that although knowledge of intoxication status may be clinically useful information, it is not a substitute for a thorough patient interview for making accurate diagnosis of PSUDs.

Second, our results indicate that structured diagnostic interviews such as the SCID may be useful tools in the rehabilitation of SCI. As issues of substance misuse among persons with SCI are not always discussed openly in treatment settings, a structured and more uniform approach may serve as a better gauge of substance misuse than other less rigorous methods.

Recall of PSUD onset before versus after injury presents distinct challenges to the rehabilitation process and may provide useful information in terms of treatment planning and outcome expectancies. Persons with SCI who report onset of their substance misuse problems before their injury present considerable rehabilitation obstacles. Research has demonstrated that persons with histories of excessive alcohol consumption before SCI are at risk for developing medical complications after injury (Tate, 1993). For example, Hawkins and Heinemann (1988) reported that patients who had abused drugs or alcohol prior to their injury were at greater risk for developing pressure ulcers, spent more time in hospitals, and had more urinary tract infections. Correspondingly, persons with "severe alcohol abuse" (e.g., those who had Michigan Alcoholism Screening Test scores of 12 and above) histories are over two and a half times more likely to have a positive pressure sore diagnosis during the first 3 years following SCI than persons who did not have severe alcohol abuse histories (Elliott, Kurylo, Chen, & Hicken, 2002).

These findings make clear that early awareness of a preinjury substance misuse problem provides information necessary for evaluating potential rehabilitation outcomes and for formulating relapse prevention strategies. For example, individuals who were misusing substances before their injury may benefit from a more assiduous outpatient follow-up initiative designed both to monitor their misuse and to assess how protracted misuse may impede the rehabilitation process. Our finding that a substantial number of those reporting intoxication at injury were substance misusers prior to SCI is also clinically relevant because researchers have identified such patients as being at risk for poorer rehabilitation outcomes (Frisbie & Tun, 1984) and, in some cases, more likely to commit suicide (Charlifue & Gerhart, 1991).

Persons with SCI whose onset of substance misuse problems occurs after their injury present equally significant clinical concerns. Risks of postinjury alcohol and drug use include worse rehabilitation outcomes, decreased life satisfaction, increased depression, and increased risk for seizures and reinjury (Heinemann, Doll, & Schnoll, 1989). Furthermore, inability to recognize the onset of substance misuse in the postinjury population, and subsequent failure to intervene, may contribute to an increase in patients' neglect of self-care and, consequently, to increased morbidity. Substance misusers with a postinjury onset may benefit

from an ancillary counseling treatment program designed both to address the potential causes of the postinjury onset and to separate SCI issues from substance misuse issues. Because the root causes of a postinjury substance misuse onset may be as detrimental to the rehabilitation process as the act of misusing itself, such patients may be candidates for therapy exclusively intended to address the origins of substance misuse or for therapeutic support systems such as group interventions.

Several limitations should be considered in generalizing the findings of this study. First, the results were based on a sample consisting only of male veterans with SCI. Therefore, they are not necessarily representative of other male veterans without SCI, female veterans, and nonveteran populations. Second, as veterans seeking treatment at a medical center, some of our participants may have been unwilling to disclose a substance misuse problem and may have been even less willing to admit to abuse or dependence in the past month (current). Third, although great efforts were made to train research assistants, it should be noted that clinicians-in-training administered the SCID. Fourth, because the number of participants reporting onset of misuse as before or after injury was not large, our ability to evaluate subgroup relationships was limited. Consideration should also be given to the fact that 7 out of 40 substance misusers could not recall whether onset of their PSUD occurred before or after their SCI. Fifth, although our designation of substance misuse was based on diagnostic criteria, misuse onset and intoxication at injury were recorded via self-report. It is also important to acknowledge the limitations of retrospectively evaluating the diagnoses of psychoactive substance abuse or dependence disorders as well as retrospectively determining the timing of onset. Because results of this study were based on retrospective data, they may have been affected by memory biases.

Further study is needed, both in individuals with SCI and in other traumatized populations, to determine how the onset of a substance misuse problem is related to traumatic injuries and their consequences. Future studies should be conducted with men and women from a variety of populations to provide data that can be more broadly generalized.

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