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Risk for Subsequent Injuries After Spinal Cord Injury: A 10-Year Longitudinal Analysis

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Abstract

Objectives—To identify: (a) the annual incidence of subsequent injury and injury related hospitalizations among individuals with pre-existing spinal cord injury (SCI) and (b) risk and protective behaviors associated with differential risk of injury.

Design—Longitudinal, mailed survey. Participants were enrolled in 1997-1998, with a follow-up conducted 10 years later.

Setting—Data were collected from participants identified from a specialty hospital and analyzed at a medical university in the Southeastern United States.

Participants—There were 1386 participants during the baseline enrollment, 821 of whom also participated in the 10-year follow-up. Inclusion criteria were: (1) traumatic SCI with residual impairment A-D, (2) non-surgical onset, (3) age 18 years or older, and (4) a minimum of 12 months post-SCI.

Main Outcome Measures—Number of injuries severe enough to require treatment in a clinic, emergency department, or hospital in the 12 months prior to the survey, and number of injury related hospitalizations. Predictor variables included selected items from the Behavioral Risk Factor Surveillance System, the Zuckerman-Kuhlman Personality Questionnaire, and prescription medication usage.

Results—Over 23% of participants reported at least 1 injury within the past year, an increase from that reported 10 years earlier by the same participants (19%), and 7% reported at least 1 injury related hospitalization. Those who reported a subsequent injury during the preliminary baseline data collection were about twice as likely to report at least 1 injury 10 years later. Binge drinking, psychotropic prescription medication use, and several personality characteristics were also related to injuries and/or injury hospitalization.

Conclusions—Risk of injury continues to be a significant concern in the years and decades after SCI onset. Behavioral and personality factors hold the key to prevention.

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Keywords

Spinal cord injury; Wounds and injuries; Prevention; Secondary conditions; Disability; Rehabilitation

Spinal cord injury occurs instantly and typically causes permanent changes in sensory and motor functioning, the extent of which is dependent on both the location and the degree of neurologic damage. Risk for SCI is not evenly distributed throughout the population but rather occurs more frequently with men (80.8%).[1] Motor vehicle collisions are the primary cause of SCI (43.1%), although acts of violence are also common, particularly among African Americans.[1] Although younger age has historically been a risk factor for SCI, the average age at onset has increased over the past decade.[2] Etiology varies by age, with falls more common among the elderly.[2] Alcohol intoxication is a risk factor for SCI onset.[3-5]

Because many SCIs are related to high risk behaviors, investigators have attempted to link behaviors leading to injury with post-injury behaviors, personality, and outcomes. Over 4 decades ago, Fordyce[6] conducted a landmark study linking imprudent behavior leading to SCI with post-injury behavior. He found individuals who exhibited imprudent behavior leading to the onset of SCI were more likely to exhibit similar behaviors after SCI onset. In another early study, Taylor[7] found elevations of 2 scales of the Minnesota Multiphasic Personality Inventory (scales 4, 5), scales indicative of impulsivity, risk taking, and traditional male interests. Temple and Elliott[8] assessed personality disorder characteristics in a sample of 44 adults with recent-onset SCI using the Millon Clinical Multiaxial Inventory. Seventy-two percent of the sample met criteria for a personality disorder, with 58% of those being categorized as having a Cluster B diagnosis. According to the DSM-III-R, Cluster B includes Antisocial, Borderline, Histrionic, and Narcissistic personality disorders, which are characterized by “dramatic, emotional, and erratic” features.

Given these findings, it is reasonable to expect an increased risk of subsequent injuries in the decades after SCI onset. In a study of 97 American Indians with SCI,[9] alcohol use was a risk factor for having at least 1 subsequent injury in the prior 12 months, and injuries were associated with an increased risk of 4 types of adverse health outcomes. Twenty-five percent of participants reported at least 1 injury within the 12 months prior to the study. In a larger study of 1328 participants with traumatic SCI,[10] 19% reported 1 or more annual subsequent injuries. Risk of subsequent injuries was higher among participants who were ambulatory, those who exhibited the sensation-seeking trait, and for those who indicated prescription medication use and heavy drinking. Lastly, Brotherton, Krause, and Nietert[11] identified risk of falls among those with ambulatory SCI, finding that 75% reported at least 1 fall in the previous year. Data from the NSCISC suggest that 4.9% of people with SCI had a long bone fracture of the lower extremity.[12] It is also noteworthy that a moderate proportion of deaths after SCI are attributable to unintentional injury (5.1%).[13-14]

In summary, SCI often relates to the individual's behaviors and personality which may create an ongoing risk for additional injuries. Although alcohol and psychotropic prescription medication have been identified as risk factors, the studies have been cross-sectional. Therefore, we do not know how risk of future injuries is affected by a history of injuries, whether the rate of injuries has remained stable, or the degree to which we can predict future injuries from past behaviors and personality.

Purpose

Our purpose was to identify the incidence of subsequent injuries and injury related hospitalizations, the extent to which this incidence has changed over the past 10 years, and

to identify behavioral and psychological risk factors. Data were first collected in 1997-1998 and then an average of about 10 years later. We tested the following hypotheses, each of which was based on the literature to the greatest extent possible:

1. Incidence of subsequent injuries will not significantly change.
2. Those who reported subsequent injuries during baseline will be significantly more likely to report injuries at follow-up.
3. Alcohol misuse, psychotropic prescription medication use, and sensation seeking will be risk factors for subsequent injuries.

METHODS

Participants

Participants were selected from inpatient and outpatient files of a specialty hospital in the Southeastern USA in 1997-1998. There were 4 inclusion criteria: (1) traumatic SCI, (2) presence of residual impairment, (3) 18 years or older at enrollment, and (4) 12 months or more post-SCI. There were 1,929 eligible cases with verifiable addresses at baseline (i.e., enrollment in 1997-1998), 1,386 of whom participated at that time (72% response rate). Of the 1386 participants, 821 again returned completed materials at follow-up 10 years later for a response rate of 59.2% (another 305, 22%, had died since enrollment in 1997–1998).

Procedures

After obtaining Institutional Review Board approval, participants were sent letters to explain the study and to alert them materials would be forthcoming. We mailed survey materials 4-6 weeks later. There were 2 follow-up mailings and a follow-up phone call. Additional follow-up phone calls were made when it appeared participants accidentally skipped portions of the survey (e.g., 2 consecutive pages were blank). Participants were offered $20 remuneration and were made eligible for drawings totaling another $1,500 at baseline and received $50 remuneration at follow-up.

Measures

We developed questions regarding subsequent injuries with the assistance of the CDC. Injuries were described as “broken bones, burns, or cuts that happened as a result of some type of mishap or event such as a fall, collision, motor vehicle wreck, or act of violence.” Individuals indicated the number of injuries they had in the past year that were “severe enough to require medical attention in a clinic, emergency department, or hospital.” Those who reported at least 1 injury were asked whether they had an *injury related* hospitalization (i.e., only those hospitalizations that individuals attributed to an injury were included).

The ZKPQ is a 99-item measure of personality with 5 scales.[15] These scales include: Impulsive Sensation Seeking: a lack of planning, the tendency to act impulsively, and a general need for thrills and excitement; Neuroticism-Anxiety: tension, worry, lack of self-confidence, and fearfulness; Aggression-Hostility: rude, thoughtless, or antisocial behavior; Activity: a need for high-energy activity; and Sociability: the number of social contacts and friends one has. Whereas the full 99-item version was used at baseline, the abbreviated 50-item version was used at follow-up. The ZKPQ has alphas ranging from .70 (Activity) to .86 (Neuroticism-Anxiety).[15]

The BRFSS[16] is used by the CDC to monitor relevant basic health behaviors within the general population and in specific regions of the United States. We selected alcohol items for the current analyses, including the number of days in past month consuming any alcohol and binge drinking (number of days in past month consuming 5 or more alcoholic drinks).

We developed a brief index of prescription medication usage during baseline to identify the frequency of psychotropic prescription medication use for treating pain, spasticity, stress or depression, and sleep. There were 4 response categories: never, sometimes, weekly, and daily. The 4 items were summed to get an overall index of usage. The alpha coefficient was . 67, which was acceptable for combining reports of behavior rather than an underlying psychological construct.[10] This scale has proven to be a powerful predictor of SCI outcomes including injuries,[10] pressure ulcers,[17] and mortality.[18]

Analysis

First, in order to determine the amount of selective attrition, we compared respondents and non-respondents (including those who died since the baseline assessment) on demographic, SCI, behavioral, and subsequent injury characteristics. Second, descriptive statistics, means and percentages, were generated to summarize the participant characteristics and outcomes. Third, the χ^2 statistic tested whether those who reported injuries at baseline were more likely to report them at follow-up, and the McNemar statistic tested differences in the portion reporting injuries between baseline and follow-up. Three dichotomous injury outcome variables were created for the 12 months prior to the survey: (a) 1 or more subsequent injuries, (b) 2 or more subsequent injuries, or (c) at least 1 *injury related* hospitalization. Fourth, t-tests were used as univariate tests of significance of the behaviors and personality characteristics. Lastly, 4 logistic regression analyses were used to identify risk and protective factors for 2 injury related outcomes: (a) 1 or more injuries; (b) 1 or more hospitalizations. We chose to dichotomize outcome variables because of the highly skewed distribution for each outcome, with most individuals reporting no injuries or no injury related hospitalizations, and because odds ratios aid in the interpretation of the findings. Separate analyses were conducted using concurrent and longitudinal predictors. The concurrent analyses were when both the risk/protective variables and the outcomes were measured at 10-year follow-up. The longitudinal analyses were when the risk/protective variables were measured at baseline/enrollment (i.e., 1997-1998) and the outcomes were measured 10 years later at follow-up. Several biographic and injury related variables were included as statistical controls.

RESULTS

Comparison of Respondents and Non-respondents

Women were more likely than men to participate (64.8%, 57.3%). Respondents were younger (38.1, 44.3) and had completed more years of education (13.4, 12.7). Race, etiology, injury level, and age at injury onset were unrelated to response status.

Sample Characteristics

The majority were white (73.9%) and male (71.5%). The average age was 48.3 years at follow-up, with 18.65 years having passed since SCI onset. Cervical injuries occurred in 53.2%, with 23.1% reporting motor functional incomplete injuries. The average education was 13.1 years. The primary etiology was motor vehicle crashes (51.3%), followed by falls and flying objects (12.5%), sporting injuries (11.5%), acts of violence (9.1%) and medical surgical complications (1.7%). 13.9% did not fit any of the categories.

Those who reported 2 or more injuries at baseline were less likely to participate at follow-up, $\chi^2[1, n=1375]=10.7$, $p<.001$, as were those who reported having at least 1 injury related hospitalization. The response rate was 44.1% among those who reported 2 or more injuries at baseline (61.3% for others). Similar differences in response rates were observed for an injury related hospitalization (44.2%, 60.7% respectively). Having 1 or more injuries during baseline was not significantly related to response ($p=.078$).

Risk of Subsequent Injuries

All indicators of injuries increased from baseline to follow up. The average number of injuries increased from 0.25 to 0.40, $t(820) = 4.96$, $p < .001$. The percentage of participants reporting at least 1 injury in the prior 12 months increased from 17.7% to 23.1% (McNemar = .003), and the portion reporting 2 or more injuries increased from 5.0% to 10.7%; (McNemar = .000). Risk of injury related hospitalization increased from 3.7% to 6.7% (McNemar = .005).

Those who reported subsequent injuries at baseline were also more likely to report injuries at follow-up. Just under 20% (19.8%) of those who reported *no* injuries at baseline reported an injury at follow-up compared with 38.6% for those who reported at least 1 injury at baseline, χ^2 (1, n=821) = 23.7, $p < .001$. The differences were greater for 2 or more injuries. Less than 10% (9.4%) of participants who did not report 2 or more injuries at baseline reported them at follow-up compared with 36.6% for those who had reported 2 or more injuries at baseline, χ^2 (1, n= 821) = 30.2, $p < .001$. Twenty percent of those reporting an injury related hospitalization at baseline also reported at least 1 upon follow-up compared with only 6.2% for those who had no injury related hospitalizations at baseline, χ^2 (1, n =821) = 8.8, $p < .01$.

Risk of 1 or More Injuries

Univariate analyses—Several baseline variables were significantly related with injuries 10 years later (Table 1), including mean differences on 3 personality scales: (a) impulsive-sensation seeking (4.33, 3.77), $t(817) = -2.53$, $p<.05$, (b) neuroticism-anxiety (3.28, 2.32), $t(818) = -4.59$, $p<.001$, and (c) aggression-hostility (4.11, 3.54), $t(818) = -2.62$, $p<.01$. The number of occasions of binge drinking violated the assumption of equal variances and was therefore dichotomized. Participants who reported at least 1 binge drinking episode at baseline were significantly more likely to report at least 1 subsequent injury at follow-up (29.4% of binge drinkers reported an injury compared with 21.6% for those who did not have at least one binge drinking episode), $\chi^2(1, n=799)=4.73$, $p<.05$. When using concurrent variables, there were significant mean differences on the same 3 personality scales. In addition, participants who reported at least 1 injury averaged over twice as many binge drinking episodes (1.47, .71), $t(815) = -2.70$,$p<.01$, and reported greater overall psychotropic prescription medication use (9.20, 7.99), $t(785) = -3.90$,$p<.001$.

Regression—Only 2 baseline (longitudinal) predictors were significantly related to 1 or more subsequent injuries at follow-up in the regression analysis (psychotropic prescription medication use, violent etiology; Table 2, Part A). For the concurrent prediction, 6 variables were risk factors for a subsequent injury (Table 2, Part B). Participants with a *less* severe SCI, either incomplete motor-functional or non-cervical, and those with a violent etiology were at greater risk for subsequent injuries. Binge drinking, psychotropic prescription medication use, and 2 personality scales (activity, neuroticism anxiety) were also risk factors for subsequent injury.

Risk of Injury Related Hospitalization

Univariate analyses—Two personality scales (neuroticism-anxiety, aggression-hostility) from baseline were significantly associated with an injury related hospitalization at follow-up (longitudinal prediction; Table 3). Binge drinking was again dichotomized due to violation of the assumption of equal variances but was not statistically significant. When measured concurrently at follow-up, prescription medication use was significantly related to injury related hospitalization, although binge drinking was not. Four of the personality scores were significant. Hospitalization was associated with higher scores for neuroticism-

anxiety, aggression-hostility, and impulsive-sensation seeking, and lower scores for sociability.

Regression—The only significant longitudinal predictor of hospitalization was age (greater risk among older participants; Table 4, Part A). When measured concurrently, those who were older and those whose injury was the result of an act of violence were at greater risk for injury related hospitalization (Table 4, Part B). In terms of personality, impulsive-sensation seeking and sociability were predictive of an injury related hospitalization, with sociability a protective factor (i.e., an inverse relationship between sociability scores and risk of hospitalization).

DISCUSSION

Subsequent injuries are a highly prevalent secondary condition after SCI and of even greater concern than previously noted. [10] Contrary to the first hypothesis, the annual incidence of subsequent injuries was significantly higher than previously reported (23%). The overall increase in the rates of subsequent injuries and injury related hospitalizations is alarming particularly since selective attrition indicated those with subsequent injuries at baseline were *less likely* to participate in follow-up. Therefore, the current estimates may be conservative.

Given differences in methodologies, there is no way to directly compare injury rates in those with SCI and in the general population (this was not our purpose). However, it is noteworthy that the portion of individuals reporting at least one injury annually (23%) was substantially higher than unintentional injuries at home in the general population, as defined by requiring medical attention or restricting activities for four or more hours (8%), or by having disability for one or more days as the result of an injury (3%).[10]

Consistent with the second hypothesis, those who reported injuries at baseline were much more likely to report them again 10 years later. Yet, subsequent injuries have received little attention in the literature, even though SCI has been associated with impulsivity or risk taking,[4, 6-7] alcohol misuse,[3-5] and violent etiologies.[6, 19-20] The ongoing risk of subsequent injuries must become a greater concern to rehabilitation and public health professionals, with prevention strategies needed to prevent recurring injuries.

The pattern of relationships of behavioral and personality characteristics with subsequent injuries and injury related hospitalizations provides mixed support for hypothesis 3. Both behavioral and personality variables were significant predictors of subsequent injuries and injury related hospitalizations (as hypothesized), although the strength of the relationship varied over time and between analyses. Having a violent etiology should serve as a red flag for subsequent injury, as this was significantly related to poorer injury outcomes 2 decades later. Although several personality characteristics were related to injury outcomes, it was surprising that sensation seeking was not more strongly related to injuries since it reflects risk-taking and has been linked to injuries in previous research.[10] Sociability was protective of subsequent injuries, although limited to injury related hospitalization. Protective personality factors are of potential importance to the prevention of secondary conditions, at least conceptually, although we could not demonstrate highly significant relationships in this study. Nevertheless, personality assessment appears central to identifying the traits that may directly or indirectly, by virtue of being stable predispositions to behaviors, relate to an elevated risk of injury.

Subsequent injuries need to become more widely recognized secondary conditions of SCI and appropriate prevention efforts need to be facilitated that follow the basic concepts of injury control. Targets of the prevention efforts should include education of both a wide

array of professionals and education of individuals, their families, and their caregivers. More comprehensive assessments are required when individuals present at outpatient clinics or emergency rooms with injury related complications in order to evaluate long-term risk of additional future injuries. Monitoring prescription medication needs to be a component of the assessment.

Study Limitations

Although this study represents a significant step forward in our understanding of subsequent injuries by virtue of having longitudinal data, several significant limitations remain. First, all data are self-report and susceptible to recall bias. The 12 month timeframe was used to limit recall bias. Second, no data were collected on the types of injuries, outside of hospitalizations. We do not know the extent to which the injuries resulted from falls, burns, or other types of mishaps. Similarly, we do not know the circumstances in which the injuries occurred and the factors that directly led to their occurrence. This type of information would be central to the development of prevention strategies.

Future Research

Additional research is needed identifying injury etiology, circumstance, and consequence. Identifying the settings in which injuries occur and the frequency with which they occur in relation to caregivers will be central to developing educational strategies for prevention. Perhaps one of the reasons why injuries have not been more front and center after SCI, particularly in comparison to pressure ulcers, is that the economic consequences have never been identified. Economic studies would help to determine how injuries compare with other secondary conditions. Additional research on the role of aging, osteoporosis, and other orthopedic changes with risk of injury or severity of injury would also have important clinical implications. The ultimate goal of injury research needs to be prevention.

CONCLUSION

Subsequent injuries are highly prevalent after SCI with about 23% of people reporting at least 1 injury per year severe enough to require medical attention. Risk of injury is significantly related to binge drinking, psychotropic prescription medication use, and several personality traits.

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List of Abbreviations

BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
NSCISC	National Spinal Cord Injury Statistical Center
SCI	spinal cord injury
ZKPQ	Zuckerman-Kuhlman Personality Questionnaire

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Table 1

Univariate analysis of risk of 1 or more injuries

	No	Yes		
	mean (sd)		t-test, p-value	df
Baseline				
How often drink 5 or more	1.01 (3.34)	1.61 (4.42)	-1.99, p = .048	797
How often use prescription drugs	7.25 (3.03)	7.49 (3.34)	-0.88, p = .378	778
Impulsivity-Sensation Seeking	7.40 (4.20)	8.10 (4.17)	-1.97, p = .050	781
Neuroticism-Anxiety	5.72 (4.41)	6.84 (4.70)	-2.96, p = .003	789
Agression-Hostility	5.58 (3.58)	6.27 (3.88)	-2.27, p = .024	790
Activity	7.95 (3.54)	8.30 (3.91)	-1.11, p = .266	776
Sociablity	7.42 (3.57)	7.36 (3.77)	0.21, p = .833	791
10-year Follow-up				
How often drink 5 or more	0.71 (2.84)	1.47 (4.84)	-2.70, p = .007	815
How often use prescription drugs	7.99 (3.70)	9.20 (3.54)	-3.90, p = .000	785
Impulsivity-Sensation Seeking	3.77 (2.67)	4.33 (2.76)	-2.53, p = .012	817
Neuroticism-Anxiety	2.32 (2.45)	3.28 (2.75)	-4.59, p = .000	818
Agression-Hostility	3.54 (2.56)	4.11 (2.69)	-2.62, p = .009	818
Activity	4.46 (2.80)	4.89 (2.74)	-1.86, p = .063	818
Sociablity	5.11 (2.39)	4.86 (2.47)	1.22, p = .222	818

Table 2

Regression: Risk of 1 or more injuries

Part A. Regression of baseline predictors on follow-up

						95% CI	
	B	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Whites (vs Nonwhites)	-0.20	0.24	0.68	0.41	0.82	0.51	1.31
Age	0.00	0.01	0.18	0.68	1.00	0.98	1.01
Years since injury	0.01	0.02	0.71	0.40	1.01	0.98	1.04
Female (vs Male)	-0.13	0.22	0.35	0.55	0.88	0.57	1.35
Injury severity (1)	0.54	0.21	6.99	0.01	1.72	1.15	2.57
Etiology	0.60	0.34	3.15	0.08	1.81	0.94	3.50
5 or more drinks	0.04	0.03	2.31	0.13	1.04	0.99	1.09
Prescription medication use	0.06	0.03	4.33	0.04	1.07	1.00	1.13
Impulsivity-Sensation Seeking	0.01	0.03	0.24	0.63	1.01	0.96	1.07
Neuroticism-Anxiety	0.03	0.02	1.99	0.16	1.03	0.99	1.08
Aggression-Hostility	0.01	0.03	0.06	0.80	1.01	0.95	1.07
Activity	0.03	0.03	0.85	0.36	1.03	0.97	1.09
Sociability	-0.01	0.03	0.03	0.86	1.00	0.94	1.05

Part B. Regression of concurrent predictors

						95% CI	
	B	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Whites (vs Nonwhites)	-0.15	0.23	0.42	0.52	0.86	0.55	1.35
Age	-0.01	0.01	1.05	0.31	0.99	0.97	1.01
Years since injury	0.02	0.02	1.13	0.29	1.02	0.99	1.05
Female (vs Male)	-0.27	0.20	1.70	0.19	0.77	0.51	1.14
Injury severity (1)	0.47	0.19	5.81	0.02	1.59	1.09	2.33
Etiology	0.66	0.32	4.28	0.04	1.93	1.04	3.60
5 or more drinks	0.06	0.02	5.49	0.02	1.06	1.01	1.11
Prescription medication use	0.08	0.03	8.68	0.00	1.08	1.03	1.14
Impulsivity-Sensation Seeking	0.04	0.04	1.04	0.31	1.04	0.97	1.12
Neuroticism-Anxiety	0.09	0.04	4.47	0.03	1.09	1.01	1.18
Aggression-Hostility	0.00	0.04	0.01	0.93	1.00	0.92	1.08

Part B. Regression of concurrent predictors

	B	Std. Error	Wald	Sig.	Exp(B)	95% CI	
						Lower	Upper
Activity	0.08	0.04	5.12	0.02	1.09	1.01	1.17
Sociability	-0.06	0.04	2.03	0.16	0.94	0.87	1.02

*Degrees of freedom = 1

Table 3

Univariate analysis of the risk of 1 or more hospitalizations

	No	Yes		
	Mean (sd)		t-test, p-value	df
Baseline				
How often drink 5 or more	1.08 (3.35)	2.09 (6.25)	-2.00, p = .046	797
How often use prescription drugs	7.31 (3.09)	7.27 (3.35)	.089, p = .929	778
Impulsivity-Sensation Seeking	7.49 (4.19)	8.60 (4.23)	-1.84, p = .066	781
Neuroticism-Anxiety	5.87 (4.49)	7.35 (4.49)	-2.34, p = .020	789
Agression-Hostility	5.64 (3.60)	7.09 (4.24)	-2.8, p = .005	790
Activity	8.07 (3.61)	7.47 (3.84)	1.16, p = .246	776
Sociablity	7.48 (3.57)	6.51 (4.07)	1.89, p = .060	791
10-year Follow-up				
How often drink 5 or more	0.87 (3.40)	1.05 (3.78)	-0.38, p = .702	815
How often use prescription drugs	8.17 (3.71)	9.58 (3.39)	-2.61, p = .009	785
Impulsivity-Sensation Seeking	3.82 (2.68)	4.89 (2.84)	-2.84, p = .005	817
Neuroticism-Anxiety	2.46 (2.50)	3.74 (2.97)	-3.63, p = .000	818
Agression-Hostility	3.59 (2.56)	4.84 (2.88)	-3.49, p = .001	818
Activity	4.58 (2.80)	4.24 (2.64)	0.89, p = .375	818
Sociablity	5.10 (2.39)	4.33 (2.62)	2.31, p = .021	818

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Table 4

Regression: Risk of 1 or more hospitalizations

Part A. Regression of baseline predictors on follow-up*						**95% CI**	
	B	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Whites (vs Nonwhites)	-0.25	0.38	0.44	0.51	0.78	0.37	1.64
Age	0.04	0.02	7.18	0.01	1.04	1.01	1.07
Years since injury	0.01	0.02	0.06	0.80	1.01	0.96	1.05
Female (vs Male)	-0.31	0.36	0.73	0.39	0.73	0.36	1.49
Injury severity (1)	0.32	0.34	0.87	0.35	1.37	0.71	2.66
Etiology	0.85	0.48	3.21	0.07	2.35	0.92	5.96
5 or more drinks	0.02	0.03	0.53	0.47	1.02	0.96	1.09
Prescription medication use	0.01	0.05	0.03	0.85	1.01	0.92	1.11
Impulsivity-Sensation Seeking	0.08	0.04	3.44	0.06	1.08	1.00	1.18
Neuroticism-Anxiety	0.03	0.04	0.51	0.48	1.03	0.96	1.10
Aggression-Hostility	0.08	0.05	2.75	0.10	1.08	0.99	1.19
Activity	-0.06	0.05	1.49	0.22	0.95	0.86	1.03
Sociability	-0.06	0.05	1.79	0.18	0.94	0.86	1.03

Part B. Regression of concurrent predictors*						**95% CI**	
	B	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Whites (vs Nonwhites)	-0.23	0.41	0.33	0.56	0.79	0.36	1.75
Age	0.05	0.01	11.04	0.00	1.05	1.02	1.08
Years since injury	0.01	0.02	0.14	0.71	1.01	0.97	1.05
Female (vs Male)	-0.26	0.35	0.52	0.47	0.77	0.39	1.55
Injury severity (1)	0.23	0.34	0.48	0.49	1.26	0.65	2.45
Etiology	1.16	0.47	6.19	0.01	3.19	1.28	7.96
5 or more drinks	-0.02	0.05	0.19	0.67	0.98	0.88	1.08
Prescription medication use	0.06	0.04	1.99	0.16	1.06	0.98	1.16
Impulsivity-Sensation Seeking	0.21	0.07	9.87	0.00	1.23	1.08	1.40
Neuroticism-Anxiety	0.04	0.07	0.46	0.50	1.05	0.92	1.19

Part B. Regression of concurrent predictors *

	B	Std. Error	Wald	Sig.	Exp(B)	95% CI	
						Lower	Upper
Aggression-Hostility	0.10	0.07	2.09	0.15	1.10	0.97	1.25
Activity	-0.07	0.07	1.19	0.28	0.93	0.82	1.06
Sociability	-0.13	0.07	3.88	0.05	0.88	0.77	1.00

* Degrees of freedom = 1