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ORIGINAL RESEARCH

Personality, High-Risk Behaviors, and Elevated Risk of Unintentional Deaths Related to Drug Poisoning Among Individuals With Spinal Cord Injury

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Abstract

Objective: To identify risk and protective factors for unintentional death related to drug poisoning from prescription medications, including opioid-related deaths, and death due to all other causes among participants with spinal cord injury (SCI).

Design: Prospective cohort study.

Setting: Large specialty hospital in the southeastern United States.

Participants: Two cohorts of SCI participants (N = 3070) (>18y) with chronic (>1y) traumatic SCI. Cohort 1 was enrolled in 1997-1998 (n = 1386), and cohort 2 was enrolled in 2007-2009 (n = 1684).

Interventions: N/A.

Main Outcome Measures: Participants completed self-report assessments including multiple behavioral variables (alcohol, smoking, prescription medication), as well as the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ). The primary outcome is unintentional death related to drug poisoning. Mortality status was determined as of December 31, 2014, using the National Death Index. The Centers for Disease Control guidelines were used for classifying participants into 3 groups: (1) unintentional death related to drug poisoning, (2) other death, and (3) alive.

Results: There were 690 deaths (23%), including 24 *unintentional deaths related to drug poisoning* (11 from opioids). Binge drinking, medication usage total score, and impulsive-sensation seeking were risk factors for unintentional death related to drug poisoning, whereas the ZKPQ activity scale was protective. Risk factors for *other* causes of death included older age, greater injury severity, being nonambulatory, regular smoker, medication use total score, and greater neuroticism-anxiety scale scores.

Conclusions: Unintentional deaths related to prescription drug overdose are associated with a set of risk factors that differs in meaningful ways from risk of death due to other causes after SCI, and these differences hold the key to prevention strategies.

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The United States is in the midst of an overdose epidemic, experiencing an alarming rise in the rate of unintentional deaths related to drug poisoning (overdose) primarily driven by prescription opioids. Nationally, unintentional injury, including drug overdose, is the fourth leading cause of death.[1] The number of deaths related to drug overdose has significantly increased in recent years.[2-4] In 2015, there were a total of 52,404 drug overdose-related deaths, roughly 2 times the number reported in 2002[2,3]; 84% of these deaths were unintentional.[5] Drug overdose is now the leading cause of unintentional death in the United States.[6] The high rate of these deaths in the general population raises concerns as to the extent to which they may be problematic among special populations who are high users of prescription medications, such as individuals with physical disabilities.

Spinal cord injury (SCI) is a serious condition that results in disability and an increased susceptibility to a wide array of secondary health conditions (eg, pain, spasticity, depression), many of which are treated via prescription medications. Polypharmacy and treatment with high-risk medications are common after SCI.[7-9] A growing body of research has linked prescription medication use after SCI with risk of adverse health outcomes,

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including unintentional injuries and all-cause mortality.[10-13] Behavioral factors, including smoking and cannabis use, and psychological and personality factors, including depressive symptoms and impulsive and anxiety traits, have been found to increase the risk of pain medication misuse.[14] Therefore, these factors may be important in relation to unintentional deaths due to drug poisoning.

Despite the potential importance of high-risk behaviors in elevating risk of mortality, most research on survival in SCI has been restricted to the study of all-cause mortality. Although most studies have focused on demographic and injury risk factors with all-cause mortality,[15-23] some studies have identified risk factors that include psychological status,[24] socio-environmental factors,[25,26] behaviors[12,26] (eg, smoking,[17] substance or alcohol abuse,[27] prescription pain medication use[13]), and poor health.[20,21,28,29] These factors show promise for the development of prevention strategies; yet, little research has been dedicated to risk factors for *cause-specific* mortality from which to develop cause-specific prevention.[30-33] Because unintentional injuries are the sixth leading cause of death according to the SCI Model Systems (accounting for 6.7% of deaths)[34] and most deaths are due to drug overdose, it is essential that we identify the patterns of risk factors related to these causes of death to develop and target effective prevention strategies for persons with SCI.

Purpose

Our purpose was to identify risk and protective factors for unintentional death related to drug poisoning and to compare these with risk and protective factors for death due to all other causes among participants with SCI using data from the SCI Longitudinal Health Study.[35-37] Our fundamental scientific questions were to determine if (1) there are differences in risk and protective factors associated with demographic and injury characteristics, substance use, and personality for unintentional deaths related to drug poisoning and all other causes of death, and (2) the nature of any differences. We used the Centers for Disease Control (CDC) guidelines and International Classification of Diseases (ICD) codes for causes of death.

Methods

Participants

After approval from the institutional review board, 2 cohorts of participants were identified through records at a large specialty hospital in the southeastern United States and enrolled in a prospective cohort study. The first cohort was enrolled in 1997-1998 and the second in 2007-2009. Three sources of records were used for participant identification from the specialty hospital used for all enrollment: (1) those treated for inpatient rehabilitation after SCI who were within the geographic catchment area for inclusion into the SCI Model Systems catchment area; (2) those treated for inpatient rehabilitation but who were outside the catchment area; and (3) those who were first treated after the initial rehabilitation hospitalization (ie, through either readmission or outpatient services). Inclusion criteria were as follows: (1) traumatic SCI; (2) minimum of 1-year postinjury; and (3) 18 years or older at assessment.

List of abbreviations:

CDC	Centers for Disease Control
HR	hazard ratio
ICD	International Classification of Diseases
NDI	National Death Index
SCI	spinal cord injury
ZKPQ	Zuckerman-Kuhlman Personality Questionnaire

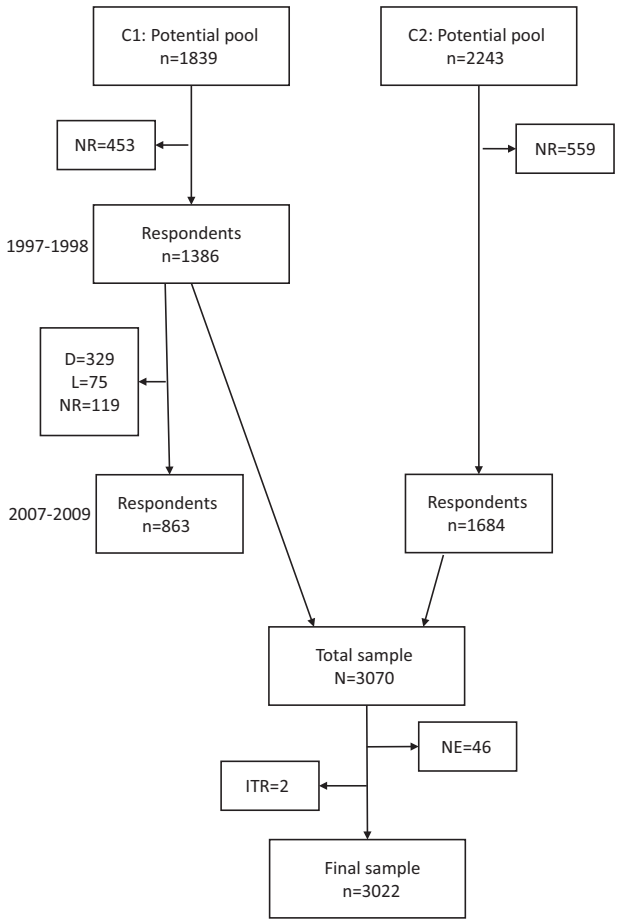

Fig 1 Flow chart of participant responses across the 2 cohorts. D, deceased by the time of the next follow-up (no further participation); ITR, invalid time record; L, lost to follow-up (could not be found—no further participation); NE, not eligible; NR, nonrespondents.

Cohort 1 consisted of 1386 respondents at first assessment (1997-1998) from a pool of 1839 cases (75.4% response rate) (fig 1). Of these, 863 responded again at follow-up. A second cohort was added in 2007-2009 with 1684 respondents (75.1% response rate). Therefore, there were 3070 respondents from 2 cohorts with the 863 participants from cohort 1 completing measures on both occasions. Of these, 46 participants were eliminated because they were fully recovered, and 2 were eliminated because of invalid time record for survival analysis, leaving a working sample of 3022. Characteristics of the 2 participant cohorts are summarized in table 1.

Procedures

All prospective data were collected using self-report assessments via mail. The data collection procedures were essentially the same