Prior depression and incident back pain among military registered nurses: A retrospective cohort study

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ABSTRACT

Background: Occupational back pain rates are substantial among registered nurses, and nurses also report high rates of depression. The role of depression as a potential predictor of back pain among nurses appears understudied.
Objectives: The objective of the study was to determine whether a history of depression predicted incident back pain in a population of military registered nurses when controlling for relevant risk factors.
Design: We employed a retrospective cohort approach using longitudinal data in which gender-specific subject groups were followed from the beginning of duty as a registered nurse to the occurrence of an outcome, or to censoring due to completion of service or the end of available data.
Participants: This study included all United States Army registered nurses who began work during 2011–2014 without evidence of prior back pain in clinical records.
Methods: Data from automatically-collected medical and administrative sources were combined and used to provide 2134 person-years of observation on 1248 individuals. These data were organized at the person-month level in a panel data structure to support discrete-time multivariable logistic regression models. The models examined the relationships between prior depression, Body Mass Index, the presence of prior combat duty and selected control variables and the outcome, the incident occurrence of back pain.
Results: The incidence rate of back pain was 18.6 per 100 person-years and the period prevalence was 31.7%. Prior depression was a statistically-significant predictor of incident back pain among female subjects (odds ratio [OR]: 1.75, 95% confidence interval [CI]: 1.08–2.83, P-value < 0.05). Body Mass Index of 30 kg/m^2 or greater, prior combat deployments, and age 36 years or older was each associated with back pain for male and female nurses.
Conclusions: The study's findings provide the first evidence of a temporal link between antecedent depression and later back pain among female military nurses. High Body Mass Index was found to be a further, modifiable risk factor for back pain in this population.

What is already known about the topic?

- Depression and back pain rates are relatively high among registered nurses and military service members.
- Back pain and depression have long been associated in the literature, but there has been little work on the possible temporal relationships between these problems when controlling for other, potential contributory factors.

What this paper adds

- Prior depression was associated with similar increases in the adjusted odds of back pain for both genders, but this association was statistically-significant among female nurses only, probably due to reduced power for males.
- Body Mass Index of 30 kg/m^2 was associated with a similar, greater than two-fold increase in the adjusted odds of back pain among the 1248 male and female nurses studied.

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1. Introduction

Registered nurses (RNs) report high rates of occupational back pain. A review of 132 international studies of workplace problems among civilian nurses (Davis and Kotowski, 2015) found that the mean, past-year back pain among nurses working in hospitals (66 studies) was 55%. While the RN workforce faces unique health risk factors and problems, the predictors of back pain among RNs have not been fully explored. Requirements such as patient handling are known to contribute to back pain in the nursing profession (Yassi and Lockhart, 2013). However, the literature reveals little work on the relationships between mental health statuses and back pain among RNs.

This deficit is noteworthy because depression rates are about twice as high among RNs working in hospitals as in the general population (Letvak et al., 2012). Depression is a common condition that is associated with back pain across multiple studies in the research literature (Hoy et al., 2010; Nicholas et al., 2011; Pinheiro et al., 2015). Depression has also been associated with a poorer prognosis in the course of back pain (Pinheiro et al., 2016).

Altogether, these ideas suggest that new research addressing the relationship between depression and back pain is sorely needed in the RN population. The military provides one structured environment in which to explore the depression-back pain association. In the total United States (U.S.) Army population, back pain is a leading problem associated with lost work time (Knox et al., 2011), medical evacuation during operational deployment (Cohen et al., 2009, 2010) and disability (Lincoln et al., 2002; Patzkowski et al., 2012). Depression is also prevalent in the U.S. military (Gaderman et al., 2012; Hoge et al., 2004).

However, as is also applicable to civilian RNs, we find scant past research that meaningfully addresses back pain or depression among military RNs. To address the gaps in the literature that we identified, we designed this study to examine incident back pain diagnoses among U.S. Army commissioned officers who began duty as RNs during 2011–2014. The specific aim was to assess whether a history of prior depression predicted later back pain when studying longitudinal data and controlling for other, potential back pain predictors.

2. Methods

2.1. Population and dataset

The study population was established using a comprehensive, de-identified medical and administrative database on the total U.S. Army at the Center for Health Information and Decision Systems of the University of Maryland, College Park. Service members from other U.S. military branches such as the U.S. Navy were not available for study. In order to assess incident back pain after subjects began work as military RNs, our potentially-eligible subjects for the study were 1320 individuals who newly entered service as such during 2011–2014. We required that there was no evidence of prior back pain in available data from prior care and duty restrictions, rendering 72 potential subjects ineligible to produce the study population of 1248 individuals.

The analytic dataset was a longitudinal panel that included military service, administrative and demographic data on the eligible subjects. The information was organized at the person-month level, with time-varying factors arranged in temporal sequence for each subject. The data sources used to produce the dataset are listed in Table 1.

2.2. Variables

Data were obtained from official sources upon which the Department of Defense depends for critical operations. Given its ability to enforce data collection policies for service members, the demographic and most of the clinically-related variables employed in this study were remarkably free of known missing values. Additional efforts

Table 1
Data sources leveraged to produce the panel dataset for analysis.

Data source	Description
Defense Manpower Data Center (DMDC)	
Active Duty Master file	Demographics and military service data
Transactions file	Discharges from service
Military Health System Data Repository (MDR)	
Combined Ambulatory Professional Encounter Record	Outpatient care in military facilities
Clinical Data Repository Vital Signs	Height and weight readings from outpatient encounters
Standard Inpatient Data Record	Inpatient care in military facilities
Tricare Encounter Data, Non-Institutional	Outpatient care in civilian facilities
Tricare Encounter Data, Institutional	Inpatient care in civilian facilities
Defense Training Management System (DTMS)	
Height/weight file	Height and weight readings from biannual body composition checks
Medical Operations Data System (MODS) (US Army, 2015a)	
Periodic Health Assessment	Height and weight readings and self-reported medical problems
eProfile	Duty restrictions assigned by clinicians

were taken during data cleaning at the US Army Office of the Surgeon General to mitigate or eliminate missing data through cross-referencing of data elements across multiple sources before the final, de-identified dataset was provided to the University of Maryland. The sole, identifiable missing data were for Body Mass Index, addressed below.

2.2.1. Dependent variable

As observed by Pinheiro et al. (2015) in a systematic review and meta-analysis of studies addressing back pain and depression, back pain definitions that result from health care-seeking or reduced functional capacity are the norm in many studies. We employed similar conceptual bases for the definition of back pain in the study population. The dichotomous dependent variable was assigned the "1" value in the person-month in which we first observed documentation of low back pain or other back ache in clinical encounter data.

The International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) system remained the diagnostic system for the military as of the time of the observed data. Eligible clinical encounters or hospital admissions were those in which selected ICD-9-CM codes documented lumbar, thoracic, or regionally-unspecified back pain (724.1, 724.2, 724.5, 847.1, 847.2 or 847.9). A "1" value for the outcome variable was also assigned when back pain was entered as a clinical condition in an assigned duty restriction reflecting short- or long-term disability. Finally, back pain was defined as being present if the patient reported back pain by selecting a formatted field for this condition in a Periodic Health Assessment screening document.

2.2.2. Independent variables

Increasing age may be associated with back pain (Hoy et al., 2010; Knox et al., 2011) and radiographically-verifiable spinal degeneration (de Schepper et al., 2010). Each subject's running age in years was classified using a categorical variable based on frequency distributions. Age was categorized rather than expressed as a continuous value due to non-linear effects, to be reported. The age categories were < 26 years (reference group), 26–28, 28–36, and > 36.

The models also controlled for the subject's self-reported race due to prior evidence of differences in disability rates for race-based groups (Niebuhr et al., 2011; Sikorski et al., 2012). We included a categorical variable for marital status in light of the previous association between being married and back pain in military populations (Knox et al., 2011). Subjects were classified as married, never married, or formerly married (divorced, separated or widowed).