

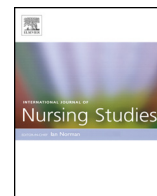


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# Scheduling and shift work characteristics associated with risk for occupational injury in newly licensed registered nurses: An observational study

Amy Witkoski Stimpfel<sup>a,\*</sup>, Carol S. Brewer<sup>b,1</sup>, Christine T. Kovner<sup>a,2</sup>

<sup>a</sup> New York University College of Nursing, 433 First Avenue, 6th Floor, New York, NY 10010, USA

<sup>b</sup> University at Buffalo School of Nursing, 210 Wende Hall, Buffalo, NY 14214-3079, USA

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### ABSTRACT

**Background:** Registered nurses across the globe bear a heavy injury burden. Every shift, nurses are exposed to a variety of hazards that can jeopardize their health, which negatively impacts their ability to provide high-quality patient care. Previous research suggests that inexperienced, or newly licensed nurses, may have an increased risk for certain occupational injuries. However, the current knowledge base is insufficient to fully understand how work hours influence newly licensed nurses' occupational injury, given the significant variation in hospital organization and work characteristics.

**Objective:** To describe newly licensed nurses' shift work characteristics and determine the association between shift type and scheduling characteristics and nurse injury, before and after adjusting for individual and combined effects of demographics, external context, organizational context, and work context, following the Organization of Work model.

**Design:** This study is a secondary analysis of a nationally representative survey of newly licensed registered nurses using a cross-sectional design.

**Participants:** The analytic sample includes 1744 newly licensed registered nurses from 34 states and the District of Columbia who reported working in a hospital and were within 6–18 months of passing their state licensure exam at the time of survey administration.

**Methods:** Descriptive statistics were calculated, followed by bivariate and multivariate Poisson regression models to assess the relationship between shift type and scheduling characteristics and nurse injury. Lastly, full models with the addition of demographics, external context, organizational context, and work context variables were calculated.

**Results:** The majority (79%) of newly licensed nurses worked 12-h shifts, a near majority worked night shift (44%), and over half (61%) worked overtime (mandatory or voluntary) weekly. Nurses working weekly overtime were associated with a 32% [incidence rate ratio (IRR) 1.32, CI 1.07–1.62] increase in the risk of a needle stick and nurses working night shift were associated with a 16% [IRR 1.16, CI 1.02–1.33] increase in the risk of a sprain or strain injury.

**Conclusions:** Overtime and night shift work were significantly associated with increased injury risk in newly licensed nurses independent of other work factors and demographic characteristics. The findings warrant further study given the long-term consequences of these injuries, costs associated with treatment, and loss of worker productivity.

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\* Corresponding author. Tel.: +1 212 992 9387.

E-mail addresses: [as8078@nyu.edu](mailto:as8078@nyu.edu) (A.W. Stimpfel), [csbrewer@buffalo.edu](mailto:csbrewer@buffalo.edu) (C.S. Brewer), [ctk1@nyu.edu](mailto:ctk1@nyu.edu) (C.T. Kovner).

<sup>1</sup> Tel.: +1 716 829 3241.

<sup>2</sup> Tel.: +1 212 998 5312.

## What is already known about the topic?

- Nurses across the globe are at risk for a variety of occupational injuries, such as needle sticks and musculoskeletal injuries.
- The factors associated with injury in nurses have been studied for many years and have linked several shift length and scheduling variables to increased risk for injury.

## What this paper adds

- Mirroring trends across all hospital-based nurses, we found that the majority of newly licensed nurses in this study worked 12-h shifts and most worked some form of overtime, primarily voluntary overtime.
- Scheduling and shift characteristics, specifically night shift and overtime of 8 h or more per week, are significantly associated with injury risk in newly licensed nurses.

## 1. Introduction

Nonfatal occupational injuries in healthcare, especially needle sticks and musculoskeletal injuries, are prevalent worldwide. These injuries burden employees, employers, and society with a range of costs – time, money, and human capital. Notably, studies spanning the globe from the United States to India to Korea have documented the disproportionate number of occupational injuries that professional nurses and nursing assistants bear (Chakravarthy et al., 2010; Clarke, 2007; Harcombe et al., 2010; Smith et al., 2006, 2009). As a large workforce engaged in direct care that involves repetitive lifting, turning, and transferring patients as well as injecting medication and inserting intravenous lines, it is easy to appreciate the hazards that nurses face every shift that they work. Despite the variation in national policy, hospital regulation, and health system sophistication, occupational injuries persist among healthcare workers (Griffith, 2013; Jagger et al., 2010).

Direct care nursing, consisting of a primarily female workforce, makes this occupational group vulnerable to musculoskeletal sprains and strains and other injuries. The factors associated with injury in nurses have been studied for many years and have linked several shift and schedule variables to increased risk for injury (Gershon et al., 2007; Hopcia et al., 2012; Lipscomb et al., 2002; Trinkoff et al., 2006, 2007). Out of this body of research, some evidence suggests that newly licensed nurses, i.e. inexperienced professional nurses, may be at increased risk for occupational injuries compared to their older, more experienced counterparts. For example, in two observational studies (Clarke, 2007; Clarke et al., 2002) and one case–control study (Canini et al., 2008) researchers observed that nurses with fewer than 5 years of experience were associated with increased odds of experiencing a needle stick; while, Patrician et al. (2011) found that experienced nurses had a protective effect against needle sticks. Inexperienced or younger nurses may incur more needle sticks because they are still developing skills, habits, and learning how to

manage work demands. Inexperience, coupled with long hours, could be especially dangerous for this group of workers transitioning to their new professional role, underscoring the need to study this population in greater depth.

### 1.1. Scheduling and shift work for U.S. nurses

Scheduling nurses in the hospital setting in the U.S. typically involve the clinical unit, its nursing staff, and one cost center. The methods used to assist with scheduling vary from using evidence-based staffing from professional organizations such as the American Nurses Association (2012) to using scheduling software to simply using a homemade spreadsheet (Eck Birmingham, 2010).

The number of nurses scheduled per shift varies among hospitals and depends on a number of factors, usually including annual budgets and estimated patient volume and/or acuity (Dent and Bradshaw, 2012). Some hospitals have formalized scheduling and staffing guidelines, based on state laws or based on collective bargaining agreements. Approximately 18% of U.S. nurses are union members (DPE, 2012). Other hospitals use informal scheduling or self-scheduling based on nurses' preferences and seniority, although most organizations have a time open for scheduling requests for a specified period (e.g. 6 or 8 weeks). Trading shifts, holidays, and vacation time may be negotiated among nursing staff, depending on the unit and organization. A nurse manager or formal guidelines might dictate how holidays and vacations are scheduled.

### 1.2. Scheduling and occupational injuries across health professions

Researchers have studied other professionals in safety sensitive industries to understand the relationship between work hours, scheduling, and safety outcomes (Barger et al., 2006, 2009). Resident physicians are also relatively inexperienced and are coping with new professional roles as they transition from medical student to physician. In a national prospective cohort study of 2737 first year residents in the U.S., lapses in concentration and fatigue were the top two reported contributing factors to percutaneous injuries. Residents working the night shift also had a higher proportion of percutaneous injuries compared with residents working on the day shift (Ayas et al., 2006). Indeed, a systematic review of residents' health and shift length found an increase in accidental exposure to blood borne pathogens during extended overnight shifts compared to regular day shifts (Reed et al., 2010).

### 1.3. Gaps in literature

There are few published studies with detailed information about the schedules and shift length practices of newly licensed registered nurses. Specifically, one study described the overtime patterns in newly licensed nurses relative to the overtime laws in the states where the nurses practiced, finding that overtime laws were associated with

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