

## **Analyzing Nurses' Impact on Outcomes Using Detailed Data**

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## **Structured Abstract**

### **Purpose:**

The overall purpose of this study was to address a number of limitations to, and gaps in, the existing literature pertaining to nurse staffing and outcomes sensitive to nurse staffing and to inform an empirically based business case for nurse staffing and quality.

### **Scope:**

This study focused on the relationships among hospital nurse staffing and clinical indicators previously identified as nursing sensitive.

### **Methods:**

An observational, single-site study was completed, accessing data from 197,961 hospital admissions and 176,696 8-hour nursing shifts across 43 hospital patient care units (n=3,227,457 unit shifts). Cox proportional hazards were used to examine associations between mortality and patient exposure to nursing shifts with 8 or more hours below modeled targets of care and high patient turnover. Logistic regressions were used to analyze association of patient and unit shift variables on a range of nurse-sensitive outcomes.

### **Results:**

Significant associations were among nurse staffing and mortality were identified, and in the expected directions. Increased mortality was associated with both increased exposure to unit shifts with nurse staffing 8 hours or more below targeted and high turnover. At the time of this report, the final analysis of associations between nurse staffing and other variables was being completed, and manuscripts were being prepared.

**Key Words:** nurse staffing, patient outcomes

**Purpose** (Objectives of Study).

The overall purpose of this study was to address limitations to, and gaps in, the existing literature pertaining to nurse staffing and outcomes sensitive to nurse staffing. There were four aims for this study. First, at the unit and shift levels of detail, analyze the frequency of specified nursing sensitive patient outcomes and test the relationship between these outcomes and alternate measures of nurse staffing. Second, at the patient level of analysis, test for relationships between the measures of nurse staffing identified above, averaged across all shifts experienced by a patient throughout their hospital stay, and the likelihood that the patient will experience nursing-sensitive outcomes. Third, identify patient and system characteristics that independently predict which patients are most likely to experience select outcomes related to nurse staffing. Fourth, provide estimates of the excess total costs for patients who experience nurse-sensitive patient outcomes.

**Scope** (Background, Context, Settings, Participants, Incidence, Prevalence).

Reports by the IOM focused national attention on the quality and safety of hospital care. There is increasing but inconsistent evidence of a relationship between hospital nurse staffing and adverse patient outcomes. Efforts to address the current nursing shortage and to strategize around the much larger shortage projected have been hampered by these inconsistencies and by gaps in the research evidence. This retrospective, historical cohort study addressed these needs by taking advantage of 4 years (2003-2006) of the unique data resources of Mayo Clinic and its hospitals, which during the study period included data on 250,000 admissions, 1.5 million patient days, and 4.5 million patient shifts.

**Methods** (Study Design, Data Sources/Collection, Interventions, Measures, Limitations).

This observational, single-site study was completed, accessing data from 197,961 hospital admissions and 176,696 8-hour nursing shifts across 43 hospital patient care units (n=3,227,457 unit shifts). Cox proportional hazards were used to examine associations between mortality and patient exposure to nursing shifts with 8 or more hours below modeled targets of care and high patient turnover. Logistic regressions were used to analyze association of patient and unit shift variables on a range of nurse-sensitive outcomes. We excluded all hospitalizations for mental health, obstetrics, rehabilitation, or pediatric care. Children were included, however, if the hospitalization included a stay on an inpatient adult care unit (e.g., postoperative cardiac surgery unit).

Data sources included the institution's administrative decision support system, patient classification, and nurse staffing. Patient data sources were accessed only to identify research authorization status.

**Results** (Principal Findings, Outcomes, Discussion, Conclusions, Significance, Implications).

Because this study could directly link patient's exposure to nurse staffing variability and because of a known staffing allocation model, many of the methodological limitations of previous studies were addressed. The findings subsequently have provided heretofore missing evidence related to nurse staffing and its association with patient safety in U.S. hospitals.

Detailed conclusions will be provided upon completion of the manuscripts.

We expect the publications and presentations resulting from this study will enable the research in the field to move from a descriptive analysis to a more explanatory and informative focus. We also expect that the findings will be used to inform policy.

**List of Publications and Products** (Bibliography of Published Works and Electronic Resources from Study—Use [AHRQ Citation Style for Reference Lists](#)).

Six papers are either under review or preparation including:

- Nurse staffing and mortality
- Mid-range theory development of nurse staffing effects
- Nurse staffing and shift-level events
- Nurse staffing and 30-day outcomes, a population-based study
- Sources of bias and error in nurse staffing studies
- Costs associated with effective nurse staffing