



ONA Nurse Staffing Literature Review
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This review includes an update to the Oregon Nurses Association's bibliography on Nurse Staffing dated April 2011 (Davidson, 2011). This review includes reliable research from May 2011-April 2014. In addition, at the end of this review, there is a presentation of classic research conducted prior to May 2011. Each synopsis will present the research findings and important interpretations. Themes and takeaways will be underlined to enhance understanding of the important aspects of each study.

Aiken and colleagues (2014) conducted a study of 422,730 patients aged 50 years or older, who underwent common surgeries in 300 hospitals in nine European countries. Surveys of 26,516 nurses practicing in study hospitals were used to measure nurse staffing and nurse education. An increase in a nurse's workload by one patient increased the likelihood of an inpatient dying within 30 days of admission by 7%, and every 10% increase in nurses holding a bachelor's degree was associated with a decrease in this likelihood by 7%. These associations imply that patients in hospitals in which 60% of nurses had bachelor's degrees, and nurses that cared for an average of six patients, would have almost a 30% lower mortality rate than patients in hospitals in which only 30% of nurses had bachelor's degrees, and nurses cared for an average of eight patients. Importantly, nursing is a so-called soft target for cost cutting measures because savings can be made quickly by reduction of nurse staffing, whereas savings through improved efficiency are difficult to achieve. The consequences of trying to do more with less could possibly result in poorer patient outcomes and even death.

Tubbs-Cooley and colleagues (2013) studied readmissions of children in 225 hospitals by linking nurse surveys, inpatient discharge data and information from the American Hospital Association Annual Survey. Registered Nurses (N=14,194) providing direct patient care in study hospitals (N=225) and children hospitalized for common conditions (N=90, 459) were included. Each one patient increase in a hospital's average pediatric staffing ratio increased a medical child's odds of readmission within 15-30 days by a factor of 1.11, or by 11%, and a surgical child's likelihood of readmission within 15-30 days by a factor of 1.48, or by 48%. Children treated in hospitals with pediatric staffing ratios of 1:4 or less were significantly less likely to be readmitted within 15-30 days. Children with common conditions treated in hospitals in which nurses care for fewer patients each, are significantly less likely to experience readmission between 15 and 30 days after discharge. Lower patient-to-nurse ratios hold promise for preventing unnecessary hospital readmissions for children through more effective pre-discharge monitoring of patient conditions, improved discharge preparation and enhanced quality improvement success.

Kelly and colleagues (2014) conducted a study of 55,159 older adults on mechanical ventilation admitted to a study hospital ICU. Patients in critical care units with better nurse work environments experienced 11% lower odds of 30-day mortality than those in worse nurse work environments. Additionally, each 10% point increase in the proportion of ICU nurses with a bachelor's degree in nursing was associated with a 2% reduction in the odds of 30-day mortality, which implies that the odds on patient deaths in hospitals with 75% nurses with a bachelor's degree in nursing would be 10% lower than in hospitals with 25% nurses holding a bachelor's degree in nursing. Critical care nurse staffing did not vary substantially across hospitals. Staffing and nurse experience were not associated with mortality after accounting for these other nurse characteristics. These findings imply that patients in hospitals with better critical care nurse work environments and higher proportions of critical care nurses with a bachelor's degree in nursing experienced significantly lower odds of death.

McHugh and colleagues (2013) conducted a study of Magnet hospitals to determine if there were lower risk-adjusted mortality and failure-to-rescue rates compared with non-Magnet hospitals, and to determine the most likely explanations. The study looked at patient, nurse, and hospital data on 56 Magnet and 508 non-Magnet hospitals. Patients treated in Magnet hospitals had 14% lower odds of mortality ($p = 0.02$) and 12% lower odds of failure-to-rescue ($p = 0.07$). The lower mortality found in Magnet hospitals is largely attributable to measured nursing characteristics. Magnet hospitals had significantly better work environments and higher proportions of nurses with bachelor's degrees and specialty certification. These nursing factors explained much of the Magnet hospital effect on patient outcomes.

Rogowski and colleagues (2013) studied the adequacy of NICU nurse staffing in the United States, using national guidelines and analyzing any associations with infant outcomes. Hospitals understaffed 31% of their NICU infants and 68% of high-acuity infants relative to guidelines. Substantial neonatal nurse understaffing was associated with increased risk of hospital-acquired infections and an increase in infant mortality.

Cimiotti and colleagues (2012) examined urinary tract and surgical site infection, the most prevalent infections reported and those likely to be acquired on any unit within a hospital. There was a significant association between patient-to-nurse ratio and urinary tract infection ($p = .02$) and surgical site infection ($p = .04$). In a multivariate model, controlling for patient severity and nurse and hospital characteristics, only nurse burnout remained significantly associated with urinary tract infection ($p = .03$) and surgical site infection ($p < .01$). Hospitals in which burnout was reduced by 30% had a total of 6,239 fewer infections, for an annual cost saving of up to \$68 million. This study provides a plausible explanation for the association between nurse staffing and health care-associated infections. Reducing burnout in registered nurses is a promising strategy to help control infections in acute care facilities. In addition, when hospitals prevent infections, they save well over \$68 million dollars per year.

Aiken and colleagues (2012) conducted a study to determine the conditions under which the impact of hospital nurse staffing, nurse education, and work environment are associated with patient outcomes. The study looked at 665 hospitals in 4 large states through linked data from hospital discharge abstracts for 1,262,120 general, orthopedic, and vascular surgery patients, a random sample of 39,038 hospital staff nurses, and

American Hospital Association data. The effect of decreasing workloads by 1 patient/nurse on deaths and failure-to-rescue is virtually nil in hospitals with poor work environments, but decreases the odds on both deaths and failures in hospitals with average environments by 4%, and in hospitals with the best environments by 10%. The effect of 10% more Bachelors of Science in Nursing Degree nurses decreases the odds on both outcomes in all hospitals, regardless of their work environment, by roughly 4%. The authors cited one way to improve work environments was through obtaining Magnet Recognition. Although the positive effect of increasing percentages of BSN nurses is consistent across all hospitals, lowering the patient-to-nurse ratios markedly improves patient outcomes in hospitals with good work environments, slightly improves them in hospitals with average environments, and has no effect in hospitals with poor environments.

Needleman and colleagues (2011) used data from a large tertiary academic medical center involving 197,961 admissions and 176,696 nursing shifts of 8 hours each in 43 hospital units to examine the association between mortality and patient exposure to nursing shifts during which staffing by RNs was 8 hours or more below the staffing target. They also looked at the association between mortality and high patient turnover owing to admissions, transfers, and discharges. There was a significant association between increased mortality and increased exposure to unit shifts during which staffing by RNs was 8 hours or more below the target level ($p < 0.001$). The association between increased mortality and high patient turnover was also significant ($p < 0.001$). This study suggests that staffing of RNs below target levels was associated with increased mortality, which reinforces the need to match staffing with patients' needs for nursing care.

Frith and colleagues (2012) examined the relationship between nurse staffing and the occurrence of medication errors on medical-surgical units. Nurse staffing has been studied as an important influence on the occurrence of medication errors, but more research is needed to identify the most effective staffing levels to achieve desired patient outcomes and avoid errors. The study showed a significant relationship between RNs in the skill mix and medication errors—as the proportion of RNs increased, the medication errors decreased. This study suggests that nursing staffing is an important human resource needed to keep patients safe. As the RN mix increased, medication errors decreased. It is estimated that medication errors cost the health care industry \$2 billion dollars annually, so perhaps increasing RNs on Med/Surg units as this research suggests would decrease overall cost to hospitals in general.

Aiken et al. (2002) researched 10,184 staff nurses and surveyed, 232,342 general, orthopedic, and vascular surgery patients discharged from 168 hospitals in Pennsylvania. After adjusting for patient and hospital characteristics, each additional patient per nurse was associated with a 7% increase in the likelihood of dying within 30 days of admission, and a 7% increase in the odds of failure-to-rescue. After adjusting for nurse and hospital characteristics, each additional patient per nurse was associated with a 23% increase in the odds of burnout, and a 15% increase in the odds of job dissatisfaction. This research suggested that the likelihood of both overall patient mortality (in-hospital death) and mortality following a complication increased by 7% for each additional patient added to the average registered nurse workload.

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