

## **How Nurse to Patient Ratios Effects Patient HAI Rates**

Sarah Sturtevant, Mackenzie Cornwell, Mat Krueger, and Alyson Christman

James Madison University

## **Abstract**

Hospital acquired infection (HAI) rates are on the rise. With this rise, questions are being asked on what is causing this increase. The purpose of this literature review was to determine if there is a correlation to hospitals that assign higher numbers of patients to one nurse and the HAI rates of that hospital. While reviewing the literature many similarities and differences were discovered. All 12 articles that were included in the study found evidence of an increase in HAI rates when nurses were assigned a higher patient count. While that was the main focus of the study, other similarities found were higher nurse to patient ratios also caused increased nurse burnout rate and a decrease in job satisfaction. One last similarity was found that when nurses were assigned more patients, they often neglected hand washing which was a number one cause in HAIs. One difference found in the literature was whether higher nurse to patient ratios had an increased risk for mortality. The 12 articles that were used for this study were found on many different databases, which included: PubMed, JMU Libraries, and the CDC.

*Keywords:* registered nurse, patient ratios in nursing, hospital acquired infections

## **Introduction**

The Centers for Disease Control and Prevention estimates that approximately 1.7 million hospitalized patients annually acquire infections while being treated for other conditions, and more than 98,000 of these patients (or 1 in 17) die as a result of the acquired infection (Cimiotti, Aiken, Sloane, Wu., 2012, p. 486). The CDC also estimates one in 31 (or 3.2%) hospital patients has a healthcare-associated infection every day (HAI Data, 2019, para. 1). Some of the most common hospital acquired infections (HAIs) are catheter-associated urinary tract infection (CAUTI), central line-associated bloodstream infection (CLABSI), ventilator-associated pneumonia (VAP), and surgical site infection (SSI).

Not only are higher nurse to patient ratios associated with higher rates of HAIs, but it is also associated with higher nurse burnout rates. Job related burnout has been linked to suboptimal medical care and patient satisfaction (Cimiotti et al., 2012, p. 486). In addition, 1 out of 3 nurses leave within two years of starting work. These attrition numbers are often attributed to a general sense of burnout that comes from being overworked and feeling pressured to take on more patients and responsibilities than is safe (Blitchok, 2018). Nurses who take on a heavier case load are known to suffer from nurse burnout which is manifested in many ways including: loss of passion for nursing, emotional strain, stress, exhaustion, and a higher rate of mistakes due to distraction. Hospital acquired infections and nurse burnout has become a top concern for hospitals and the little research that has been done on the topic showing evidence that the two are related. It is important for nurses to understand the relationship between HAIs and nurse to patient ratios. When staffing is not sufficient, nurses are unable to provide the necessary care to their patients due to lack of time, resources, and focus which results in an increased risk of negative patient outcomes. The purpose of this literature review was to determine if lower nurse to patient ratios decrease hospital acquired infection rates in the acute care setting.

## Synthesis of Literature

Upon reviewing the literature there were studies that directly addressed the question posed by this review, and indirectly addressed it by studying the relationship between NPR and factors related to HAI rates, such as compliance with handwashing protocol. Three articles (Cimmiotti et al., 2012; Blegen, Goode, Spetz, Vaughn, & Park, (2011); Twigg, Gelder, & Myers, (2015) presented evidence of a significant relationship between lower healthcare provider to patient ratios and lower HAI rates. Cimmiotti et al. (2012) concluded that an additional patient assigned to each nurse could result in an increase of infection rate of 0.86 or 0.93 for UTI or surgical site infections, respectively. Blegen et al. (2011) found lower infection rates to be associated with higher total staffing in both ICUs and General adult units. While Twigg et al. (2015) had a broader scope, considering nurse sensitive outcomes (NSOs) which included but was not limited to HAIs, an increase in the prevalence of all NSOs was seen for understaffed shifts.

Three other articles (Alyahya et al., 2018; Mehta et al., 2014; Papastavrou, E., Andreou, & Efstathiou (2014) assessed the relationship between best infection prevention and control practices, and NPRs. Papastavrou et al. (2014) suggested that when nurses lack sufficient time and resources, they are forced to prioritize aspects of nursing care to provide care they believe is the most important to each patient, which inevitably leaves important work left undone such as patient hygiene. Alyahya et al. (2018) found that higher NPRs may have better compliance with key practices such as regular handwashing, a key to preventing HAIs, which was found by Mehta et al. (2014) to be a practice that varies widely in compliance rates.

While most of the articles that were included in this research had data that was consistent with the others there was one article that had information that was contradictory. Many articles stated that while there was a relationship between high nurse to patient ratios and HAIs, there was no difference seen in

high nurse to patient ratios and patient mortality rate. Carayon and Gurses concluded that “there was no association between hours of nursing care per patient and the in- hospital death rate and the rate of adverse outcomes” (Needleman et al., 2002, p. 1718). Twigg and colleagues (2015, p. 7), had similar findings, “nursing sensitive outcomes such as mortality, FTR, CNS complications, pulmonary failure, and shock/cardiac arrest were found to not be correlated with the understaffing of nurses”. On the contrary, Driscoll and Li had opposite findings; “Nurse-to-patient ratios were found to have the most influence on in-hospital mortality. For every additional nurse, patients in-hospital mortality was 14% less (Driscoll et al., p. 19) and “The presence of HACs resulted in substantially higher mortality and resource utilization for cardiac surgery patients. Higher RN staffing was associated with lower mortality for CLABSI and CAUTI (Li et al., 2016, p. 538).

The articles included in this synthesis presented with several limitations. Many studies only conducted research at one or few hospitals which limited the applicability of the results (Alyahya et al., 2018; Blegen et al., 2011; Papastavrou et al., 2014; Twigg et al., 2015). Since unit staffing and nurse hours were continuously changing and dependent on the specific hospital unit, other studies found a limitation to be accurately deciding what exactly constituted “understaffing” of nurses or exactly how many hours nurses provided care to the patients (Blegen et al., 2011; Li et al., 2016; Twigg et al., 2015). This made it difficult for the studies to truly capture the association of understaffing nurses to negative patient outcomes and HAIs. One last major limitation was that since the information gathered was not gathered with this specific research article in mind, the data could have been skewed to benefit the other study. While Li did not suspect this, it was a possible limitation to the accuracy of the data (Li et al., 2016, p. 539).

### **Recommendations**

Reducing the number of patients per nurse is ideal however, it is not always possible when nursing staff is low. Because of this knowledge the articles have discussed some other ways in which

hospitals can reduce the number of HAIs associated with higher nurse to patient ratios. In the one study they discussed changing the behaviors and perceptions the healthcare providers had towards HAIs (Alyahya et al., 2018, p. 1354) and implementing a human factor engineering approach that would decrease the nursing workload (Carayon & Gurses, 2008). In turn, this would implement increasing the nursing hours of operation to improve the patient outcomes. This would mean less health care staff would interact with a given patient decreasing their chances of contracting HAIs (Blegen et al., 2011, p. 412). Another study discussed the need to create a better working environment that would alleviate stresses within the nursing profession. With a decrease in work related stress, it was believed that this would "alleviate job-related burnout in nurses" leading to an improved quality of patient care as well as retention of nurses (Cimiotti et al., 2012, p. 489). Retaining more nurses over time would also create lower nurse to patient ratios overall. Nevertheless, it is important to attain more data in various levels and units in the nursing profession to further understand the impacts the nurse-to-patient ratios have on HAIs.

### **Conclusions**

There is no denying that preventing the understaffing of nurses is an essential component in improving the overall quality of care for patients in the hospital. Not only are appropriate nurse-patient ratios important in the prevention of patients acquiring HAIs, but it is equally important in preventing nurse burnout from an unmanageable workload. However, through this literature review, the research proved to be inconclusive in suggesting that higher nurse to patient ratios resulted in an increase in HAI rates. The majority of the articles supported the claim that an understaffing of nurses resulted in less time spent with patients, increased mistakes, and poor hygiene techniques, which ultimately leads to the patient acquiring an HAI. In contrast, other researchers found minimal evidence that suggested higher nurse to patient ratios to be directly and solely correlated to the patient acquiring hospital infections. These articles suggested that other factors contributed to the HAIs. Although, it is important to note that none of the

articles found negative effects of having less patients to each one nurse. Regardless of the differing research claims, it was evident that hospitals keeping safe nurse to patient ratios is imperative to the patient and nurse to decrease the risk of negative outcomes.

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