Critical Appraisal of a Journal Article

Introduction

Adequate nurse staffing in hospitals has been shown to be associated with positive health outcomes for patients, provision of better quality healthcare services, lower mortality rates, and decrease in duration of hospital stay. However, the exact numbers of nurses required for patients suffering from specific conditions vary and depend on several factors such as available technologies, specialists, and incidence of co-morbidities in the population. Studies have shown that a lower nurse to patient ratio is linked to increased adverse events for patients in hospitals; however, this finding may or may not be applicable to all hospital settings and patient health conditions (Griffiths et al., 2019).

A study conducted by Jansson et al. in 2019 aimed to study the association between nurse staffing and a specific adverse health event that is a common occurrence for patients on mechanical ventilation in the ICU, which is ventilator-associated pneumonia (VAP). Their study uncovered a definitive link between nurse staffing, nurse workloads, and high incidence of VAP cases in a specific patient population. This paper provides a critical appraisal of the study by Jansson et al. (2019) focusing on its strengths, limitations, and relevance of the findings in the current health and nursing contexts.

The research problem and its significance

This research paper has focused on an important aspect of healthcare services, which is intensive care or critical care services (Jansson et al., 2019). People who are critically ill suffer from extremely severe illnesses and often have co-morbidities that predispose them to poor health outcomes and early death. Any person may suffer from critical illnesses irrespective of age or gender, and the patient may either be at home or in the hospital. Patients suffering from these types of illnesses require emergency and critical care that is expert and, at the same time, rapid. Apart from expert care, the patients also require observation, assessment, and monitoring so that the existing conditions are not exacerbated due to internal or external factors. Negligence at this stage can lead to extreme suffering and premature death in the patients. As a result, health outcomes of critically ill patients are directly related to knowledge and expertise of nurses and appropriate nurse staffing to ensure care delivery to all critically ill patients (Schell et al., 2018).

In this primary research article, the authors have chosen to focus on a specific aspect of critical care services, which is ventilator-associated pneumonia (VAP) and subsequent mortality (Jansson et al., 2019). It has been estimated that VAP is responsible for at least 50% of all pneumonia cases that occur in the hospital in the intensive care unit (ICU). The rate of VAP is around 9% to 27% in patients who are on mechanical ventilators and it occurs early during the course of hospitalization. VAP is the most common nosocomial infection in patients undergoing mechanical ventilation and second most common infection that occurs in the ICU. Depending on the underlying illness and co-morbidities, age and gender of the patient, and the quality of healthcare services provided to the patient, the mortality rate of VAP varies from 33% to 50% in different hospital settings (Kalanuria et al., 2014). Due to the high occurrence and mortality rates of VAP in the ICU, Jansson et al. (2019) have chosen to understand the relationship between nurse staffing and occurrence of VAP in critically ill patients.

The research methodology and research design

This study was a prospective and observational cohort study aimed at understanding the association between nurse staffing and incidence of VAP in a tertiary-level teaching hospital. The hospital was a 900-bed facility in Finland with 22 beds in the ICU and admission of around 2000 patients per year with a 3-day average duration of hospital stay. Every day, five specialists and two residents were present in the ICU for 7 hours from 7:30 AM to 2:30 PM, and for the rest of the time, only one specialist or resident was present in the ICU. During the period of the study, the nurse to patient ratio was estimated to be 1.2:1. It was also noted that specialist physicians from different departments conducted daily rounds in the ICU to check up on the patients (Jansson et al., 2019).

As the study setting was a tertiary-level hospital, it ensured that patients with a wide range of conditions and co-morbidities would visit the hospital for specialist care, thus expanding the sample quality. Another point to be noted here is that the study setting was a teaching hospital, which means that nursing and other students would be assigned shifts for the purpose of their professional training and education. It is not clear if the authors took this into consideration while calculating the nurse to patient ratio. Ideally, student nurses should not be considered a permanent part of the hospital as their numbers are not constant and they may not independently be able to provide quality healthcare services to patients. The authors have mentioned in one place that they took into consideration the number of 'available nurses' on any given day. This number may not be accurate as it may include student nurses who are not permanent workers at the hospital. Further clarity is required to understand the types of nurses that were considered while calculating the nurse to patient ratio in the study setting (Jansson et al., 2019).

The study design was prospective, observational, and cohort study which is relevant given the objective of the study. The authors recruited a study sample of critically ill adult patients in the ICU who were on mechanical ventilation for a period of at least 48 hours. As the study design was prospective, the authors aimed to estimate the percentage of patients in the study sample who developed pneumonia and relate this to the number of nurses present in the ICU. The study design allowed the authors to observe the nurse to patient ratio in the ICU during the study period and understand the relationship between this ratio and the number of VAP cases in the ICU (Jansson et al., 2019).

The research methods

The authors conducted the study for a period of 8 months and, based on their objective, recruited patients who were admitted to the ICU and were on mechanical ventilation for a minimum duration of 48 hours. In order to eliminate confounding variables, they eliminated those patients who were already diagnosed with pneumonia prior to being admitted in the ICU and who were immunologically weak due to a diagnosis of AIDS. They also met the ethical requirements of research by obtaining written informed consent from the participants or their family members before the start of the study (Jansson et al., 2019).

The diagnosis of VAP was done by collecting and assessing chest radiographs for both lungs separately. Despite the fact that multiple specialists were involved in assessing the chest radiographs,

the absence of other diagnostic penumonia tests might have resulted in a misdiagnosis or differential diagnosis. With recent updates in diagnostic health technologies, the authors could have used more reliable tests such as quantitative polymerase chain reactions for detecting molecular markers, gas chromatography for detecting bacterial markers of pneumonia, and microbiological analysis of lung secretions (Koenig and Truwit, 2006). Another approach could have been using these techniques to re-confirm pneumonia diagnosis after the chest radiographs indicated a positive diagnosis of pneumonia (Macht et al., 2014). However, the authors have not indicated any method other than chest radiographs to confirm the diagnosis of pneumonia in the study participants. Another concern is analyzing whether the study participants developed pneumonia due to mechanical ventilation or complications of existing health conditions. The authors haven't indicated the possibility of differential diagnosis of VAP and steps taken to avoid it (Goel et al., 2016).

The assessment of nurse to patient ratio in this study was done using the Therapeutic Intervention Scoring System (TISS) and the Intensive Care Nursing Scoring System (ICNSS). ICNSS is a remarkably relevant tool here as it takes into account the severity of health problems of the patients and the number of nurses required to provide care to the patients based on the extent of their health conditions. As the study was based in a critical care setting, the occurrence of disease severity and co-morbidities in the patients required the ratio of nurse to patient ratio to be greater than 1:1, and this was taken into account by using the ICNSS tool (Pyykko et al., 2004). The TISS tool is also employed in critical care settings to quantify nurse workloads, evaluate ICU costs, and estimate the use of ICU resources (Hariharan et al., 2007). Hence, the use of both the tools by the authors was accurately able to calculate the nurse staffing (ICNSS) and nurse workloads (TISS) in the ICU.

Findings and their relevance to contemporary nursing policy and practice

This study found that insufficient nurse staffing and increased nursing workload is directly and strongly associated with the incidence of VAP and mortality in the ICU. This finding is significant because several studies have identified the problem of nurse staffing and its association with several different complications in the ICU (Glette et al., 2017; Kiekkas et al., 2019). In light of the increase in number of adverse events and patient deaths as a result of insufficient nurse staffing, this study is relevant as increase in number of nurses and reduction in their workloads can potentially save several lives and reduce the global health and financial burdens. As this study is specific to cases of ventilator-associated pneumonia, it has important implications for critically ill patients on mechanical ventilation as VAP is the most common ICU-acquired infection shown to increase mortality of patients by about 30% (Gunasekera and Gratrix, 2016).

Despite the high prevalence of VAP in the ICU, there has not been any study to draw a link between nurse staffing, nurse workloads, and VAP (Jansson et al., 2019). This study has not only explored this association, but has also used universal scoring systems such as ICNSS and TISS to add value to their findings. The authors of this study found that the nurse to patient ratios were considerably lower for patients who acquired VAP as compared to other patients. This finding is significant as it proves that a clear association exists between the number of nurses available and the number of patients who acquire VAP. However, the converse hypothesis has not been addressed by the authors

according to which, increasing the nurse staffing levels and decreasing nursing workloads lower the incidence of VAP in ICU patients. This may be difficult to achieve as the numbers of professional nurses are decreasing in relation to the number of patients requiring critical care services, and specifically, mechanical ventilation (Jansson et al., 2019). Additionally, the authors have not addressed other possible explanations for increased number of VAP cases such as underlying patient conditions, use of suboptimal health equipment, and insufficient maintenance of hygiene that may have acted as risk factors for leading to VAP in patients (Kalanuria et al., 2014).

Conclusion

In conclusion, the study conducted by Jansson et al. (2019) has addressed an important gap in the literature, which is the relationship between nurse staffing, nurse workloads, and incidence of VAP in critically ill patients. Although several previous studies have shown that nurse understaffing is heavily linked to increase in adverse events for patients in the ICU, this study has been the first to specifically explore the underlying causes of occurrence of VAP in the ICU. The study setting has been a single tertiary hospital in Finland and similar studies need to be conducted in different hospitals in urban and rural areas before the results of this study can be extrapolated. Nevertheless, the study findings are significant and point to an important limitation in terms of nurse numbers and workloads and their association with adverse health outcomes for patients.

Despite the few limitations regarding the definition of nurses for the calculation of nurse to patient ratios, diagnostic criteria of VAP, and consideration of underlying risk factors for the development of VAP, the study has demonstrated the use of several advanced techniques. The authors' use of ICNSS and TISS scoring systems for calculation of nurse to patient ratios takes into account the severity of patient disease which is important in critical care settings. Additionally, their consideration of nurse workloads is also significant because nurses with lesser workloads have been shown to be more efficient during their shift in providing quality healthcare services to patients.

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