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Using Patient-Staff Ratio to Improve Patient Care Outcomes

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,

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Abstract

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Project Submitted in Partial Fulfilment

of the Requirements for the Degree of

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Abstract

The persistence of nurse scarcity has been documented by many researchers as the leading problem in the critical care setting. A high nurse to patient ratio leads to poor healthcare outcomes associated with increased nurse burn out, medical errors, and low-quality care services. Solving the issue of nurse scarcity is still a challenge due to lack of an effective multidimensional staffing model. In this project, a multidimensional staffing model was developed based on the relationship between patient-to-staff ratio, together with and other factors in the care environment which impacts patient outcome. The project was framed on Donabedian's structure, process, and outcomes model. The research question involved establishing the multidimensional staffing model on the interaction between staffing levels and other contextual factors in a critical care setting. The research methodology involved a systematic review of 13 articles to develop the evidence-based best practice multidimensional staffing. The inclusion criteria were articles published between 2014 and 2019 and had been developed from quantitative methods, mixed methods, systematic reviews, or meta-analyses. A thematic analysis was used as the main data analysis method to develop meanings, subjectively, from the collected data. The results show that the best staffing model for nurses in a critical care unit is the nurse-to-patient ratio model. The proposed nurse-to-patient ratio is 1:2. These findings have strong implications for the nursing practice and the patients since the nurse-to-patient ratio model will lead to an increased number of nurses, reduced workload, and improve patient outcomes.

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Dedication

I would first like to express my gratitude and praises to Almighty God for his strength and wisdom through my postgraduate program and the rigorous process of my project.

I also want to say a heartfelt thank you to my supportive husband, Funso Timothy. Thanks to my precious children who are jewels, Boluwaji, Foluwake, Motunrayo, and Oluwatimilehin Timothy for allowing me time away from them to focus on my studies. Children you deserve a trip to Disney! It would be a big mistake to fail to recognize the unconditional love and support from my parents Mr and Mrs Olatise. The countless times you flew in from Nigeria and cared for my children during my hectic schedules will not be forgotten, you are worth more than gold. To my sisters, Helen Olobashola and Funmilayo Jewesimi, thanks for your prayers and support. The three of us rock. Finally, I say thank you to Walden University and its faculties for the opportunity to grow and making my dream come true. I dedicate this final capstone project to my family for your support and missed family times during my DNP journey.

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Section 1: Nature of the Project

Introduction

High patient-to-staff ratios remain a significant health care problem because of the associated adverse implications on patient outcomes. The high ratios have existed historically and are projected to persist. The expected long-term significance of nurse scarcity establishes the need to address its adverse implications on patient outcomes (Catalono, 2015). This is because the high ratios have r been associated with poor patient outcomes that include high mortality rates, hospital-acquired infections, and medication errors (Driscoll et al., 2018; Linda, et al., 2018; MacPhee, Dahinten, & Havaei, 2017).

Other factors in the care setting, however, interact with the patient-to-staff ratio to determine patient outcomes. Technical support within a care setting and staff skills, based on evidence from a study in South Africa, as well as task-level interruptions, patient complexity, and patient flow, based on study findings from Canada, are examples of contextual factors, which interact with patient-to-staff ratio, to determine patient outcomes (MacPhee et al., 2017; Malatji, Ally, & Makhene, 2017). Further, evidence from a U.S. study identifies the significance of collaborations among stakeholders and remuneration-based motivation on patient outcomes (Garner, Lwin, Sickler, Hunter, & Shepard, 2018; Winstein, et al., 2016).

Reducing patient-to-staff ratios could be costly because nurses form a large percentage of healthcare workers. A large number of nurses and the associated high cost of hiring the nurses, consequently, would be necessary for reducing the ratios (American Nurses Association, n.d.). However, other factors, such as technical support, staff skills, and task level interruption can be moderated at minimal or no cost to care facilities. The persistent significance of high patient-to-staff ratio to patient outcomes, despite existing knowledge on the determinants of patient

outcomes, identifies a gap between education and practice about staffing and factors that could affect its outcomes. This practice project seeks to address this by understanding the root cause of the difference and developing a staffing framework for facilitating informed use of patient-to-staff ratios to ensure positive patient outcomes.

A systematic review of literature will be used in the study to identify factors in the care setting that interact with patient-to-staff ratios that influencing patient outcomes as well as the involved interactions. I then created a model for an improved matrix of contextual factors in care settings and optimal staffing levels for improved care settings. The anticipated social change of this project could result in reformed policies and practices in health care institutions towards informed staffing levels and improved contextual factors thus resulting in improved patient outcomes.

Problem Statement

The dearth of knowledge for addressing the problem of high patient-to-staff ratios and its implications of poor patient outcomes underlie the practice project problem. Evidence exists on the single-dimensional relationships between patient-to-staff ratio, as well as other factors in the care setting, and how they relate to patient outcomes (MacPhee, Dahinten, & Havaei, 2017; Malatji, Ally, & Makhene, 2017; American Nurses Association, n.d). The inability to address the problem of the nurse shortage, based on the evidence of its persistence, requires the need to shift focus to the interaction effects in patient-to-staff ratios and contextual factors that impact patient outcomes; by doing so, practitioners can moderate the impacts of patient-to-staff ratios on patient outcomes (Catalono, 2015). Other factors could mediate or moderate the relationship between staffing levels and patient outcomes (Driscoll, et al., 2018; Garner, Lwin, Sickler, Hunter, & Shepard, 2018; Hsieh, Gu, Shin, Kao, Lin, & Chiu, 2015; MacPhee, Dahinten, & Havaei, 2017).

The contextual scope of the relationship establishes the complexity of using staffing ratios to influence patient outcomes and it identifies the need for a multi-dimensional approach to improving patient outcomes through staffing levels.

Existing evidence, however, identifies dimensional relationships among staffing levels, other factors in the care setting, and patient outcomes. The necessary staffing level for positive patient outcomes depends on multiple factors to an organization, which can be internal and are factors within the control of a care organization, or external as factors beyond the control of a care organization. Staff skills and technical support within an organization are some of the internal factors determining the necessary staffing level for positive patient outcomes (American Nurses Association, n.d). Other internal factors influencing staffing levels for the realization of care goals are staffing challenges within an organization, task-level interruptions that undermine the effectiveness of staff, and the cost of hiring nurses (MacPhee, Dahinten, & Havaei, 2017; Malatji, Ally, & Makhene, 2017; American Nurses Association, n.d). The significance of the cost of hiring nurses, however, also has external aspects that emerge through the reimbursement framework (Medicare, 2016). Patient complexity and patient flow are other external factors impacting staffing levels because of their effects on the demand for nursing services (American Nurses Association, n.d; American Nurses Association, 2012). Staffing level is fundamental to meeting the need for care because of the roles nurses play, such as patient assessment and diagnosis, planning and implementation of interventions, coordination of care, and the evaluation of care outcomes (American Nurses Association, 2015).

The legal and regulatory environments that determine financial liability for noncompliance, such as laws on the duty of care, or reimbursement for compliance are other external factors to staffing levels (Berkowitz, 2016; Konetzka, Sharma, & Park, 2018;

Stevenson, Spittal, & Studdert, 2013). Medicare and Medicaid's provisions for reimbursement levels are examples of the regulatory frameworks that influence staffing levels. The Joint Commission (n.d.) also offers a framework for evaluating the performance of healthcare facilities, including the process and quality of nursing care, to determine nursing staffing. Preparing nurse managers for the use of optimal staffing levels, which satisfies the internal and external factors, therefore, is necessary for ensuring positive patient outcomes. A nursing shortage exists, despite the frameworks for adequate nursing levels, and its forecasted persistence establishes the need for a solution to the problem of shortage to reduce the adverse effects on patient outcomes (Butler, 2016; Catalono, 2015; Linda et al., 2018).

Multiple factors, consequently, exist in the care setting and influence patient outcomes through independent effects, or effects under interactions with other elements. An in-depth understanding of the relationship between patient-to-staff ratio and patient outcomes within the context of other factors to patient outcomes in the care environment is necessary for ensuring the effective use of staffing levels and staffing plans to improve the quality of health. This project, based on the evidence, identifies the need to develop a framework for optimal staffing, based on interactions between staffing levels and other factors in the care setting. The significance of the nurse shortage, the association of nurse shortage with poor patient outcomes, and the possible ability to moderate the association between patient-to-staff ratio and patient outcomes exemplify the importance of the problem and the need to address it. High patient-to-staff ratios have been associated with poor patient outcomes, and the forecasted persistence of shortage of nurses means a sustained risk of poor patient outcomes (Linda et al., 2018). This project, in seeking to develop a staffing model tool for the optimal use by staff to address the patient-to-staff ratio, presents a solution to the persistent effect of nursing shortage through a possible identification of

a model for improving patient outcomes, even under the existing staffing levels. The possible identification of a model for the optimal patient-to-staff ratio under environmental factors in the multi-dimensional context could also motivate advocacy and policy measures for the realization of feasible nurse staffing levels. Addressing the problem, consequently, may influence standards for the informed use of patient-to-staff ratio to improve patient outcomes.

The project is fundamental to the field of nursing practice through its relevance to fundamental elements of the scope of nursing practice. The scope of nursing practice defines the legal mandate of a qualified nurse professional in the provision of care services and includes the protection of public health and optimization of health and abilities (Perry, 2016; American Nurses Association, n.d.). Nursing, according to the American Nurses Association, should ensure the optimal application of resources for the prevention and management of health conditions and suffering, as well as for the advocacy. In seeking to identify a model for the optimal use of patient-to-staff ratio under the effects of contextual factors, this project is significant to the realization of the goal of the element of the scope of nursing practice. The project may provide a basis for influencing advocacy for the use of the optimal frameworks for the delivery of care in addition to promoting optimal applications in nursing. The scope of nursing also establishes the goal of achieving the highest level of quality of life of populations, and the project investigates a model for realizing that objective. Nursing shortage and other contextual factors are significant to patient outcomes, and simple dimensional models exist on their relationships with the patient outcomes (Catalono, 2015; Butler, 2016; Linda et al., 2018). The factors, however, interact with each other, and a multidimensional model is necessary for a comprehensive understanding of their overall effects on patient outcomes. The lack of such a multidimensional model establishes the need for the study. A model for optimal interaction of factors in the care environment

towards improved care outcomes, however, promises a better quality of health among populations.

Purpose

With this practice project, I seek to bridge the gap in practice by developing a staffing model for informing sufficient staffing and management of contextual factors affecting the relationship between staffing levels and patient outcomes. The lack of a multi-dimensional model for determining optimal and feasible staffing levels and moderating the effects of the staffing levels on patient outcomes is the existing gap in practice. The project seeks to create a model using the systematic review of literature on the interaction between staffing levels and other contextual factors for informed staffing decisions. The lack of a comprehensive model for explaining the persistent significance of high patient-to-staff ratio, especially among nurses, is the meaningful gap-in-practice the doctoral project seeks to address. The scarcity of nurses has been significant and is predicted to worsen, which implies a trend of its worsening adverse effects of poor patient outcomes (Catalono, 2015; Butler, 2016; Driscoll et al., 2018; MacPhee, Dahinten, & Havaei, 2017; Garner et al., 2018; Hsieh et al., 2015).

I will explore the following practice problem question: In the critical care setting, what is the multidimensional staffing model on the interaction between staffing levels and other contextual factors? This practice problem question is the basis for the purpose of the project.

My project has the potential to address the gap through consolidating existing evidence on factors to patient outcomes and the relationship between these factors, to develop a staffing model for optimal staffing levels and validating the model in a critical care setting. Evidence exists on relationships between factors in the care delivery environment and patient outcomes, though the evidence is limited to single dimensions of relationships. A synthesis of the evidence

on the relationships offers a basis for identifying a model of interaction effects of the factors. Using the model in the critical care setting could improve staffing levels in units and the effectiveness of nursing towards improved patient outcomes. The project, therefore, can inform nurse managers on critical patient-to-staff ratios for the realization of desired health outcomes and the necessary moderation of other factors in the care environment for the optimization of patient outcomes.

Nature of the Project

The need to develop a quality improvement best practice evidence-based model for determining optimal staffing levels is the practice problem. The problem forms the basis for the research question on the best staffing model for optimal staffing levels and patient outcomes under different contextual factors. Existing literature on staffing grids offers a basis for developing a multidimensional staffing model that will be implemented in a care setting. The articles compiled were systematic reviews meta-analyses and research projects using quantitative and mixed methods. I chose article published in peer-reviewed journals to use in the project. The articles will be sourced from the Cochrane Library, the Joanna Briggs Institute EBP Database, the Evidence-Based Practice Guide at the Walden University Library, Medicare, Joint Commission, and Medline. Thematic analysis will be used to organize and analyze the collected evidence (Kuckartz, 2015) for the development of the targeted staffing model. The data analysis approach involves the identification of themes and concepts, from codes, together with associations among the themes and ideas. The concepts of staffing, staffing ratios, staffing models, contextual factors, and patient outcomes from data sources, together with their relationships, will be used to develop a multidimensional model (Kuckartz, 2015).

Significance

The development of an effective staffing model for informing staffing levels and moderating structural and process factors for optimal effects of staffing levels on patient outcomes in the critical care setting is the expected outcome of the study. Individuals, families, communities, care professionals, care facilities, policymakers, professional organizations in the healthcare sector, healthcare advocates, and scholars are the stakeholders to the project. The outcome is a quality improvement best practice evidence-based model for staffing grids. The susceptibility of individuals, families, and communities to healthcare issues, the role of healthcare professionals in the provision of care, and the roles of care facilities, policymakers, professional organizations, and advocates in regulating care establish the stakes. Anticipated results of the project, on the effects of the developed model on staffing, other factors that relate to staffing, and patient outcomes are significant to scholars because of the possible needs to validate the results in the critical care setting and beyond. Outcomes of the project may also identify new gaps for future research on the interaction between structural and procedural factors in the care setting in determining care outcomes and the roles of nurse managers in moderating the factors towards optimal patient outcomes.

The project is significant to the management of care. Care facilities, therefore, can benefit from the developed model to improve their care outcomes, from the informed decisions on the structural and process factors to the provision of care, and for the realization of expectations from patients, regulatory bodies, and advocacy groups. Policymakers and professional organizations can also use the developed multidimensional staffing model to define thresholds of structural and process factors for the realization of desired patient outcomes. The outcomes of the project can also inform regulatory measures of policy and professional organizations on the

necessary competencies and roles of nurse managers. The American Nurses Association and state and provincial policymakers who define the authority and responsibility of healthcare professionals can apply the developed model to define roles and responsibilities of care facilities and managerial personnel in promoting care (Perry, 2016).

Outcomes of the practice project could also be significant to advocacy groups, which could benefit from the project outcomes through the identification of the need to implement specific measures for improved patient outcomes. The possible positive implications of the project on patient outcomes also establish the significance of the project to communities, families, and individuals, who are the beneficiary of such improved care outcomes. Improved patient outcomes, with its effects on reduced pressure on the healthcare system, also establishes the significance of the project to the efficacy of the care system. The dearth of knowledge on the complex relationship of factors in the delivery of care also establishes the significance of the practice project to the expansion of literature, which could shift the focus of future projects to the development of theories and models for the optimal integration of human resource with other resources and contextual factors in the care setting. This practice project focuses on a model for informing staffing in the critical care setting to realize improved patient outcomes. The similarity of the environmental factors across other practice areas in care settings establishes the transferability of a developed model from this project to alternative specialty areas. The project, because of its significance to care facilities' management, policymakers, and advocacy groups, also promises a role in influencing a reformative social change. The results could develop a model for improved patient outcomes, which could result in policy changes through internal and external forces on the management of care facilities.

Summary

Nurse shortage is a significant problem in healthcare, and its significance to patient outcomes establishes the need to address it or its adverse implications on the quality of life of populations. Evidence exists on the relationships between patient-to-staff ratio, other factors in the healthcare setting impacting this ratio, and patient outcomes, though a dearth of knowledge exists on the multidimensional effects of these factors on patient outcomes despite the interdependence of the factors. In this project, I seek to develop a multidimensional staffing model for the optimal use of staffing levels, based on contextual factors within the critical care setting, towards improved patient outcomes. Reformative social change, through developing a framework for managerial policy changes, is the possible social change implication of the project. The project aims at developing a model for the effective use of patient-to-staff ratio and staffing plans in improving patient outcomes, a scope that establishes its relevance to different stakeholders in the health sector, and nursing practice. The existing literature on relationships between factors in the care settings and patient outcomes establishes the ability of the project to address the problem through the systematic review of the literature. I will use thematic analysis to analyze data for the development of a multidimensional staffing model. The project is significant to such stakeholders as providers of care, recipients of care, regulatory bodies in the health sector, and advocacy groups in the sector. The next chapter develops the background and context of the project.

Section 2: Background and Context

Introduction

The identified problem is the lack of a multidimensional model on the effects of staffing levels, together with other contextual factors, to improve patient outcomes. The purpose of the project is to develop this model for addressing the adverse effects of high patient-to-staff ratios on patient outcomes. The multidimensional staffing model aims at facilitating the identification of optimal staffing levels, based on the available human resources, and the moderation of other contextual factors of enhanced effectiveness of nurses. The problem identifies the need to develop a best-practice evidence-based and multidimensional staffing model for staffing grids and moderation of contextual factors. The following practice-focused question will be addressed: In the critical care setting, what is the multidimensional staffing model on the interaction between staffing levels and other contextual factors?

In this section, I present the background and context of the project. The section begins with a discussion of concepts, models, and theories underlying the project. The relevance of the problem to nursing practice, local background, the context of the problem, and the role of me as the DNP student are then discussed. I end the section with a summary.

Concepts, Models, and Theories

Donabedian's structure, process, outcomes model underlies the project. According to the model, the process of care, the structure, and care outcomes offer information for assessing the quality of care (Washington & Leaver, 2015). Structure, process, and outcomes, consequently, are the involved concepts. Structure defines the context within which care occurs and includes such elements as equipment in a care setting, staff, and financial resources. Process, however,

refers to the interaction between care providers and patients in the delivery of care, while outcomes define health conditions following the healthcare process (Washington & Leaver, 2015). The model informs the project because of its applicability to the targeted relationship between staffing, other factors in the care environment, and care outcomes. Structure, process, and outcomes offer data for assessing the quality of care, and the data can be applied to identify the interaction among the concepts, which underlies the aim of the project (Washington & Leaver, 2015). Staffing, which is an element of the structural aspect of the care setting, interacts with other aspects of structure, as well as elements of the concept of the process to yield outcomes. Existing literature on the elements of the concepts of structure, process, and outcomes, and the relationships among the elements form a basis for developing a model for the involved interactions through the systematic review of the literature.

Avedis Donabedian is the seminal scholar on the model. The original work has a simple scope that promotes leadership and practical advice for quality assurance in the delivery of care. However, the work does not acknowledge the modern improvement model and its applicability to change is limited. The exposition on quality of care and its assessment, however, offers a sufficient basis for the structure-process-outcome model and informs the use of the model to translate knowledge, on the relationship to practice, to practice (Donabedian, 2003).

Terms used in the project that may have multiple meanings are staff and environment. Staff is used in the project to refer to practicing nurses, under the regulatory frameworks of the legal system and requirements of relevant professional organizations. The environment, however, refers to factors in a patient's environment, which have significant effects on the quality of health of a patient or the capacity of a patient to seek self-care or assisted care (Masters, 2014).

Relevance to Nursing Practice

History of the Broader Problem

The problem of developing a multidimensional staffing model for addressing the significance of a nursing shortage is relevant to nursing practice because of the persistence of this shortage, despite the application of diversified strategies to address the problem in the past. The issue has a historical context that traces to as early as the year 1945 (Newman, 2013). The nurse shortage after the Second World War persisted for more than 2 decades. It was attributed to low levels of remunerations, contrary to the perception that nurses left their jobs to take care of their families. The problem of nurse shortage again emerged in the 1990s with wage and staffing issues as the causes (Newman, 2013). Shortage of faculty that limits the number of trained nurses has been another cause of the shortage in the United States (Pham, 2011). The historical trend of the shortage has corresponded with undermined access to care and reduced quality of health (Newman, 2013).

The historical perspective of the nursing shortage, including the identified causes and solution of the problem, further explains the persistence of the problem and its implications on patient outcomes, as well as the need for a new approach to addressing it. Perceived causes of nursing shortage in the 1940s included unfair working schedules that forced nurses to miss meals and harsh work environments from poor human resource management (West, Griffith, & Iphofen, 2007). The aging population, with its effects on the reduced supply of nurses as more nurses retire, reduced efficacy of the nursing as the population of elderly nurses expands, and increased demand for nursing as the aging population exerts pressure on nursing care because of increased health population has been another historical factor to the nursing shortage (Meadows, 2002). The rate of nurse entry to the profession also declined towards the end of the 20th

century, significantly, and the persistence of such factors as straining working conditions and low pay could have facilitated the problem after the year 2000 (Meadows, 2002).

The persistence of the problem over the past decades, despite the application of diverse strategies, indicates the historical weakness of the applied solution and the need for an alternative path to addressing the issue of nurse shortage and its implications on patient outcomes. The identification of harsh conditions nurses faced in the United Kingdom in the 1940 triggered measures that did not succeed in addressing the problem, which is still applied despite their failure to solve the issues of the nursing shortage and its implications (West, Griffith, & Iphofen, 2007). The strategies include improvements on the welfare of nurses, integration of information technology in nursing, improved working schedules for nurses, improved coordination for reducing labor costs, and policy changes (Meadows, 2002; Smith, 2002; West, Griffith, & Iphofen, 2007; Wright & Bretthauer, 2010). Nurse shortage, however, remains significant in the contemporary care setting with adverse implications on patient outcomes (Driscoll, et al., 2018; Jordi, Pierre-Yves, Jerome, Katiuska, Francois, Pascal, & Laura, 2014; MacPhee, Dahinten, & Havaei, 2017; Lee, Cheung, Joynt, Leung, Wong, & Gomersalt, 2017). The problem of the nursing shortage, with its adverse implications on patient outcomes, consequently, is historical, and attempts to develop its effective solutions have failed. The failure to create a solution to the problem of nurse shortage establishes the need for a solution to the adverse effects on patient outcomes. The possible moderator effects of the other structural factors and process factors in the care setting, under the Donabedian's structure, process, outcomes model, offers a basis for developing the solution (Washington & Leaver, 2015).

Current State of Nursing Practice in the Area and Recommendations to Improve Practice

The contemporary scope of nursing practice reflects the historical significance of nurse shortage, its implications on patient outcomes, and attempts to address the problem (Catalono, 2015; Butler, 2016). The current state of nursing practice identifies operations of care facilities under high patient-to-staff ratios and adverse implications of the high ratios on patient outcomes. High workloads, higher than 52 on the Therapeutic Intervention Scoring System-76 scale, a scale for quantifying the number and types of care treatments, occur in ICU and other care settings and this identifies the existence of nurse shortage (Lee et al., 2017; MacPhee, Dahinten, & Havaei, 2017). Evidence from Germany and the United Kingdom supports the nursing practice under nurse shortage, which has been associated with poor patient outcomes (Driscoll et al., 2018; Wendsche, Hacker, & Wegge, 2017). The nursing shortage has further been associated with poor patient outcomes that include mortality, medication errors, patient falls, and urinary tract infections (Lee et al., 2017; MacPhee, Dahinten, & Havaei, 2017). Other experienced implications of the high patient-to-staff ratios are pneumonia and ulcers (Driscoll et al., 2018). The current state of nursing practice, consequently, identifies the significance of high patient-to-staff ratio by incidence and implications on patient outcomes.

Recommendations have also been made for changing the scope of some of the current practices. Changes have been recommended for increased wages of nurses, which could have similar motivational effects as the pay-for-performance programs (Mariano, 2015; Hsieh et al., 2015; Garner et al., 2018). Recommendations have also been made for changes in federal funding, nursing education, and human resource practices with possible implications of attracting and retaining more nurses in the profession (Brunell & Ross, 2015; Dietrich & Anderson, 2012). The recommendations, however, and as the current practices, consider the problem from single

perspectives and may fail to address the problem as current practices have. The effectiveness of the pay-for-performance programs has also been established from a narrow perspective. It may fail in the wider care setting, as has been the case of the increased reimbursements to nursing facilities (Medicare, 2016).

Applied Strategies and Standard Practices to Address the Problem in the Past

Implemented measures for addressing the problem include the expansion of the number of care personnel through grants, scholarships, and loans to students for expanding the nursing workforce through new entrants into the profession (Dietrich & Anderson, 2012). Legislative frameworks, in addition, have been developed for supporting disadvantaged nursing students and workers to facilitate attraction and retention of the population segment in the profession (Dietrich & Anderson, 2012). Increased reimbursements to nursing facilities have also been used, as an element of the regulatory framework, to try and increase staffing levels in the facilities, though the approach has achieved little success (Medicare, 2016). Evidence from the enforcement of tort laws supports the inadequacy of the legal and regulatory framework to address the problem of nurse shortage and its associated poor patient outcomes (Stevenson, Spittal, & Studdert, 2013). Negligence claims against nursing homes, that emerges from inefficiencies in the provision of care has been associated with worsened patient outcomes. Enforcing the legal or regulatory measures, which have been proposed addressing the adverse implications of nursing shortage on patient outcomes, consequently, does not yield the intended results but instead worsen patient outcomes (Medicare, 2016; Stevenson, Spittal, & Studdert, 2013). Pay-for-performance programs, however, have demonstrated the ability to improve patient outcomes, and the involved motivational effects could explain the benefits (Hsieh et al., 2015; Garner et al., 2018). Researchers have also explored the problem from uni-dimensional perspectives that do not

consider the interdependence among different structural and process factors in the determination of care.

<div align="center">**Local Background and Context**</div>

The Relevance of the Problem

The historical problem of high patient-to-staff ratios has been associated with poor patient outcomes such as increased mortality rate, increased incidence of hospital-acquired infections, and the incidence of pneumonia (Linda et al., 2018; Driscoll et al., 2018: MacPhee, Dahinten, & Havaei, 2017). The relationship between the staffing ratio and patient outcomes, however, is complex. Efficacy issues, which establish the significance of the process concept of the Donabedian's model as well as the structure concept, influence patient outcomes through defining nurses' workloads and the quality of nurses' output (Lee et al., 2017; Jordi et al., 2014). Lee et al. (2017) and Jordi et al. (2014) establish the significance of staffing levels in critical care settings such as the intensive care units and settings for the care of critically ill patients while Driscoll et al. (2018) identify the significance of nurse staffing levels on patient outcomes acute specialist units. The significance of patient complexity to staffing levels, which establishes the need for higher levels of staffing in critical care settings, supports the need to develop a solution to the staffing problems, especially in critical settings (American Nurses Association, n.d; Jordi et al., 2014).

Other factors in the Donabedian's model, besides the patient-to-staff ratio, however, have also been associated with patient outcomes. The age of care professionals, job satisfaction, and a personnel's level of productivity influence patient outcomes (MacPhee, Dahinten, & Havaei, 2017; Garner et al., 2018; Hsieh et al., 2015). Environmental factors, socioeconomic status, gender, and self-perception of quality of health among patients also influence health outcomes

(Zheng, Ren, Shi, & Lu, 2019; Kitonsa, Manyanja, Aling, Kiwanuka, Namutundu, Anywaine, …, Kaleebu, 2019; Shinde, Balushi, Hossny, Jose, & Busaidy, 2018). Addressing the problem of poor patient outcomes, therefore, requires a comprehensive approach that optimizes the effects of the elements of the structure and process of care. Patient-to-staff ratio, therefore, can be modelled with other elements of the structure and the process of care for optimal patient outcomes, and the project seeks to develop such a model.

Institutional Context to Which the Problem Applies

The problem of high patient-to-staff ratio and its implications on patient outcomes apply to the governance context of an institution that is responsible for managing the 'structure' and 'process' elements of care. Policymaking and managerial decisions on the elements are the anticipated implications of the results of the project and these establish the significance of the project to governance at the micro, meso, and micro levels of the management of care. Policy and regulatory frameworks at the state and federal levels are the applicable contexts to this project. The influence of the frameworks over the care environment establishes the relevance of the policy and regulatory frameworks. Legal institutions and professional bodies, for example, can use the anticipated model from the project to influence the role of care facilities and nurses in moderating the care environment.

Definition of Locally Used Terms

High 'patient-to-staff' ratio is the locally used term relevant to the understanding of the project. A high patient-to-staff ratio refers to the availability of fewer nurses, about the outlined or expected number, for a given number of patients (Driscoll et al., 2018). The ratio will be interpreted from the contexts of the sources of evidence and will be translated to the recommended ratio in the nation.

Role of the DNP Student

The role of the DNP scholar will be the objective translation of existing evidence into a multidimensional staffing model for improving patient outcomes. The scholar will develop the targeted model based on existing literature on structural and process factors in the delivery of care. The DNP scholar has no emotional attachment to the topic, and the scholar will use an objective approach to the identification of sources of evidence. The use of software in data analysis, in addition, will maintain a gap between the project and the DNP scholar. The role of the DNP scholar is consistent with the provisions of the DNP essential on 'organizational and systems leadership for quality improvement.' The scholar will evaluate and translate exiting evidence on the practice problem and disseminate the results for practical application in the efficient use of patient-to-staff ratios. The role of the scholar in translating evidence aims at establishing a basis for policymaking and, possible, advocacy initiatives, a scope that aligns it with the DNP essential of 'health care policy for advocacy in health care.' The role of the DNP scholar in the translation of evidence also applies to the DNP essentials of 'clinical prevention and population health for improving the nation's health' because of the goal of developing a model for addressing adverse implications of experienced nurse scarcity.

The primary motivation of the DNP scholar for this project is the need to advance knowledge and nursing practice. The DNP scholar desires to be part of the solution to the nursing problems facing the nation and other parts of the world. The significance of the expected outcomes to the problem of staff shortage and its implications on patient outcomes, consequently, motivates the scholar. The need to fulfil the institution's requirement for the conferment of the doctoral program also motivates the scholar as the conferment of the doctoral degree depends on the successful completion of the project. Bias in the selection of articles to be

reviewed is a potential threat to the project, and it could be significant to the credibility of the outcomes of the project. An objective approach to the recruitment and screening of articles for review will eliminate the risk of bias.

Summary

The project seeks to address the problem of the attributed poor patient outcomes to high patient-to-staff ratio through developing a multidimensional staffing model on the relationship between patient-to-staff ratio, together with other factors in the critical care setting, and patient outcomes. Donabedian's model underlies the project. Evidence identifies the complex scope of the implications of patient-to-staff ratio on patient outcomes and but previously applied solutions to the problem of high patient-to-staff ratio have narrow scopes. The project seeks to bridge the gap by translating the existing evidence into a model for improving patient outcomes through the realization of optimal patient-to-staff ratios or moderating positively, the effects of the ratio on patient outcomes. A systematic review of the literature based on the scope of the project is proposed. The next section discusses the proposed approach for collecting and analyzing the evidence in the systematic review approach.

Section 3: Collection and Analysis of Evidence

Introduction

Nurse shortage remains a significant issue with adverse implications on patient outcomes. The possible interactions with other structural and process factors in the care setting, which lead to improved patient outcomes, identifies the need for a multidimensional staffing model for the improved competency among nurse managers in the management of the effects of patient-to-staff ratios on patient outcomes. Evidence exists on relationships between patient-to-staff ratio, as well as other factors in the care delivery environment, and patient outcomes. Existing models for the relationships, however, lack a multidimensional scope that can inform the effective use of patient-to-staff ratio in improving patient outcomes. The project seeks to develop a multidimensional staffing model on the interactive effects of patient-to-staff ratio, with other factors in the care environment, on patient outcomes for improving the use of staffing in managing patient outcomes. Developing the multidimensional staffing model and using it in staffing, consequently, could address the significance of nurse shortage and its implications on patient outcomes by utilizing positive moderator effects in the developed model.

This section outlines the proposed approach for developing a model of the association between patient-to-staff ratio and other factors and the impact of the association on patient outcomes. The section begins with an overview of the practice problem question. Proposed sources of evidence and the approach to data analysis and synthesis are then discussed. A summary of the section is then offered.

Practice Focused Questions

The need for improved knowledge on the factors to patient outcomes and their interactions in the care setting, through a best practice evidence-based staffing model, for the optimal use of patient-to-staff ratio to improve patient outcomes is the local problem the project seeks to address. The persistence of nurse scarcity, the adverse effects of high patient-to-staff ratios on patient outcomes, and the narrow scope of existing literature about individual factors to patient outcomes inform the problem. The lack of a comprehensive model for understanding the multidimensional scope of care is the targeted gap-in-practice. Evidence exists on factors to patient outcomes, including the patient-to-staff ratio. Still, an integrated model on the multiple factors, which could identify the real significance of the factors and inform the management patient-to-staff ratio under contextual factors, is lacking. The following practice-focused question is explored for bridging the gap-in-practice: In the critical care setting, what is the multidimensional staffing model on the interaction between staffing levels and other contextual factors?

This systematic review of the literature module will be used to develop the evidence-based best practice multidimensional staffing. The existence of literature on relationships between factors in the care setting and patient outcomes and the ability to quantify and evaluate learning and patient outcomes establishes the suitability of the approaches. The methodology is also suitable for the complex scope of the project and the need for generalizability of the results to the entire scope of nursing practice. I focus this systematic review of literature on a specific problem and develop in-depth knowledge of the problem, a scope that is consistent with the focus of the project on a single problem of the persistent significance of nurse shortage (see Denscombe, 2014). The complex scope of the problem, which may not be feasible under

quantitative designs because of the inability to investigate all possible correlates of patient outcomes in a single project, and the need for a high level of credibility, also establish the suitability of the approach for the project. The approach consolidates findings from other sources and derives its credibility and dependability from the characteristics of applied studies (Denscombe, 2014). The involved rigor in the selection of sources for use in the review, which establishes the relevance of applied studies to a problem and the quality of the applied studies also ensures the ability of the approach to developing a model for application in solving the problem of the persistent significance of nurse shortage to patient outcomes.

The following are the operational definitions of key concepts in the project.

Patient-to-staff ratio: Patient-to-staff ratio is the number of patients that are assigned to a single staff in a healthcare facility per shift (Driscoll et al., 2017). The ratio, in the context to patient-to-nurse ratio, refers to the number of patients assigned to a nurse in a shift.

Patient outcomes: Patient outcomes is the measure of adverse events in patients, such as mortality, the severity of symptoms, incidence of hospital-acquired infections, and readmission rates (Driscoll et al., 2017).

Quality patient care: Quality patient care is the degree to which offered care meets patients' care needs and is consistent with contemporary professional knowledge (Johnson & Reppert, 2015).

Sources of Evidence

The Cochrane Library, the Joanna Briggs Institute EBP Database, the AHRQ, the evidence-based practice databases of the Duke University Medical Center Library & Evidence, other outlined databases in the evidence-based practice guide at the Walden University Library,

Medicare, Joint Commission, and Medline will be the sources of evidence for developing the multidimensional staffing model.

The sources of evidence will be used because of the expected high level of the quality of evidence in their databases, which is relevant to the scope of the project. The Cochrane Library has a collection of databases in healthcare specialty, with the focus of promoting the availability of evidence in evidence-based nursing. Some of the databases in the Cochrane Library are dedicated to evidence from controlled trials, systematic reviews, and meta-analyses. The extensive partnership with different categories of stakeholders, including healthcare professionals and scholars, as well as the care to avoid conflict of interest in its funding are some of the features of the library that establish the quality of its evidence (Cochrane, N.d.). The evidence-based practice database from the Joanna Briggs Institute, another targeted source, also offers applicable evidence to the improvement of care outcomes. The database is developed from collaborations with many entities across the globe for the development and translation of scientific evidence to practice (Joanna Briggs Institute, 2018). Sources of evidence outlined in the evidence-based practice guide at the Walden University Library will also be used. The sources include the AHRQ and the evidence-based practice databases of the Duke University Medical Center Library & Evidence (Walden University, N.d.). Medicare, the Joint Commission, and Medline will be used because of their scopes as rich repositories of evidence on the delivery of healthcare.

The project seeks to develop a model on the optimal use of staffing levels, based on the effects of other contextual factors within the critical care setting, towards improved patient outcomes. The sources of evidence offer a pool of data on the targeted relationships for the realization of the objective of the practice problem. The focus of the sources on evidence-based

practice and healthcare outcomes, which include positive care outcomes, establishes the purpose of the project within the context of the evidence in the databases. The practice-focused question relates to the interaction between the patient-to-staff ratio with other factors in the healthcare setting in influencing patient outcomes. Data collection and analysis, which will focus on models for the relationships between patient outcomes, the factors, will offer evidence on correlations between factors to patient outcomes, as well as the direct, indirect, and interaction effects of the factors on patient outcomes. The identified relationships will then inform a multidimensional model from which the accurate relationship between patient-to-staff ratio can be determined, and factors can be moderated for the optimal outcomes from feasible patient-to-staff ratios.

The Cochrane Library, the Joanna Briggs Institute EBP Database, the AHRQ, and the evidence-based practice databases of the Duke University Medical Center Library & Evidence are the selected databases for use in the project. Google will be the search engine in the recruitment of articles for the review. *Patient-to-staff ratio*, *patient-to-nurse ratio*, *patient outcomes*, *factors affecting patient outcomes*, *nurse effectiveness*, *mediator factors*, and *moderator factors* will be the key search phrases. *Patient-to-staff ratio* or *patient-to-nurse ratio*, used interchangeably, *patient outcomes*, and *factors affecting patient outcomes* will be the primary search phrases. The following combinations of search phrases will be used.

- *Patient-to-staff ratio*

- *Patient-to-nurse ratio*

- *Staffing ratio*

- *Staffing level*

- *Patient outcomes*

- *Quality of life*

- *Factors affecting patient outcomes*

- *Moderator factors*

- *Mediator factors*

The primary search will involve the combination of the related phrases to staffing levels with *patient outcomes*. The phrases *moderator factors* and *mediator factors* will further be added to the primary combinations of phrases to expand the search. The review will rely on published articles from the year 2014 to 2019 to ensure the relevance of the results to the contemporary care environment. Articles, besides, will be considered for inclusion if they will have been developed from quantitative methods, mixed methods, systematic reviews, or meta-analyses. The use of multiple key search phrases and combinations of phrases, the use of multiple sources of evidence for literature search, and the inclusion of publications in many years promise an exhaustive and comprehensive search for the desired level of depth and complexity of the scope of the project.

Analysis and Synthesis

Thematic analysis, which develops meanings, subjectively, from the collected data and data collection process, will be used to analyze the data (Kuckartz, 2015). The Joanna Briggs' framework for conducting systematic reviews and the evidence-based medicine pyramid for ranking quality of evidence will be used to assure the integrity of the evidence for developing the proposed model. The framework offers guidelines for the appraisal of studies with different designs. It ensures the validation of rigor in methodologies of selected studies as well as the relevance of selected studies to the objective of a systematic review (Greenhalgh & Brown, 2017). The data analysis approach involves the development codes from constructed meanings, which are grouped into themes and are analyzed for associations (Kuckartz, 2015). The DNP

scholar, based on background knowledge on the involved concepts and the underlying conceptual framework of the project, will synthesize the studies, subjectively, to identify codes on structure, process, and outcomes. Themes from categories of the developed codes and relationships among elements of structure, process, and outcomes of care, including the directions of the relationships and interaction effects in the relationships, will be targeted. Outliers and missing data will be discarded to ensure the consistency of synthesized data.

Summary

The section details the proposed sources of evidence for the project and the proposed data analysis approach. Databases such as the Cochrane Library and the Joanna will be the sources of evidence. The sources offer results on evidence-based practice and healthcare concepts whose scopes identify with the targeted concepts of patient outcomes and their correlates. The collection and analysis of the evidence on the relationship between patient outcomes and factors in the care environment will offer a basis for the integration of models for the relationships for the generation of a multidimensional model. Patient-to-staff ratio, patient-to-nurse ratio, patient outcomes, factors affecting patient outcomes, nurse effectiveness, mediator factors, and moderator factors will be the key search phrases. The phrases will be combined with the recruitment of sources on targeted relationships. Articles developed through quantitative methods, mixed methods, systematic reviews, and meta-analyses, published in the selected databases from 2014 to 2019, will be used. The use of multiple combinations of search phrases, as well as the use of multiple databases, will ensure an exhaustive and comprehensive search. The Joanna Briggs' framework for conducting systematic reviews will be used to assure the integrity of the evidence while the DNP scholar will analyze data subjectively.

Section 4: Presentation of the Results and Findings Section

Introduction

The purpose of this project is to develop a staffing model for informing sufficient staffing and management of the relationship between staffing levels and patient outcomes. The existing gap in nursing practice is the lack of a multi-dimensional model for determining optimal and feasible staffing levels and moderating the effects of the staffing levels on patient outcomes. Through a systematic literature review, I created a model that helps to understand the interaction between staffing levels and other contextual factors for making informed staffing decisions. The following practice-based research question is addressed in this project: In the critical care setting, what is the multidimensional staffing model on the interaction between staffing levels and other contextual factors?

This section is organized into three main parts. In the first part, I discuss the process used to collect secondary data. Description of the sample, as well as sample representation, is also discussed in this part. In the second part, I present results from the data collected. Evaluation and summary of the results are also presented in this section. The third and last part of this section is a summary of the results in relation to the research question.

Collection of Secondary Data Set

Data were collected from key databases such as the Cochrane Library, the Joanna Briggs Institute EBP Database, the AHRQ, and the evidence-based practice databases of the Duke University Medical Center Library & Evidence.

The inclusion criteria for articles used in this study was based on three factors. First, the articles had to be relevant and focus on models that can help to address nursing shortage or

address the issue of nurse staffing. Second, all peer-reviewed articles and systematic reviews

with a clear description of methodology and research findings were included. Third, articles

whose results match with the study topic were chosen for this study. For the exclusion criteria,

articles whose title did not relate to the project title were not used. Articles that did not have a

clearly described methodology for data selection and explanation of the results were excluded in

this study. See Figure 1 for a visual of how I determined article inclusion.

Figure 1. PRISMA flow diagram.
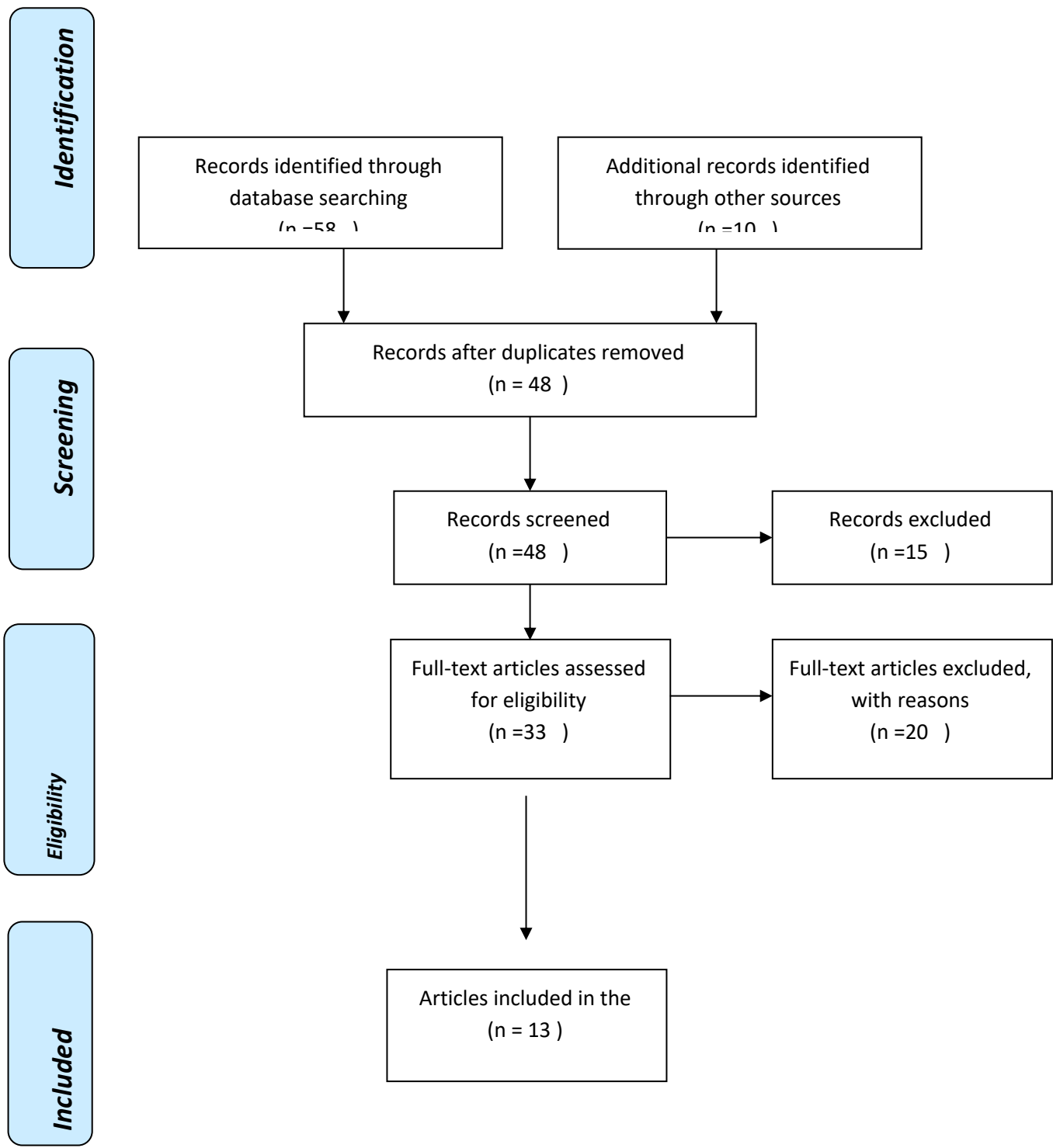
Fifty-eight publications were identified from the databases searched in this study. Through a review of reference lists in these publications, 10 more articles were identified to be relevant to the study topic leading to a total of 68 articles. However, 20 were duplicates and had to be eliminated at the first stage. For the remaining 48, 15 lacked a clearly described research methodology, hence they were eliminated. 20 more articles also failed to meet the inclusion criteria, with most of them focusing only on discussing factors contributing to the nursing shortage. Other articles failed to specify the study population and setting. Only 13 studies met the inclusion criteria and were therefore selected for this project.

Methodological Quality of the Recruited Studies

The 13 articles used in this review had different study methodologies. From the publications selected, there were 3 longitudinal studies, 2 cross-sectional studies, 3 cohort studies, and 5 systematic reviews. Randomized controlled trials were not used in any of the identified articles. The studies reviewed had detailed information on how data was collected, analyzed and related to the research problem.

Study Characteristics

The focus of the articles selected was to determine nurse-patient-ratio and the implications on the patient outcomes. This review involved studies published between 2012 and 2020. The study methodologies applied in the selected studies include cohort studies, longitudinal studies, cross-sectional studies, and systematic reviews. The articles reviewed had acute and critical care settings. Nurses and patients were the main samples considered in all the

studies. For all the 13 articles, more than 100,000 nurses and 300,000 patients have been included in the research, either in a cohort, observational or systematic reviews. More than 100 hospitals were also included in the studies selected. The major study characteristics are nursing – to-patient ratio, nurse staffing model, and quality of healthcare. The nursing-to-patient ratio entails the number of patients per each nurse. The nurse staffing model includes the approach used to identify correct staffing requirements such as the number of nurses. Then, quality of healthcare includes mortality rates, fall rates and patients with hospital-acquired pressure ulcers, all related to the level of nurse-to-patient ratio.

Analysis of Findings

Relationship between Workload and Staffing Ratio to Patient Outcome

In several studies reviewed, the authors discussed how workload and staffing ratio influences patient outcomes. A study by Lee et al. (2017) examined if a high nurse workload/staffing ratio decreased a survival rate among critically ill patients. Lee et al. (2017) adopted a cohort study design, which entailed a retrospective analysis of prospectively collected data. The authors hypothesized that increased exposure to inadequate workload/staffing ratio among patients in ICU settings led to high mortality rates.   Results show that 925 admissions occurred during the study. 98 deaths occurred in the ICU whereas 166 deaths happened before discharging patients from the hospital. From the analysis, the probability to survive following hospital discharge was 95% and was likely to occur at a maximum patient-to-nurse ratio of <40. When this ratio was increased to > 52, the probability to survive also improved to more than 95%. These findings show that a strong association exists between nurse workload/staff ratios and hospital survival. According to Lee et al. (2017), failure to increase the number of nurses in relation to the rising number of patients could decrease the patients' survival.

In a related study, Driscoll et al. (2018) investigated the impact of nurse-to-patient ratios on patient outcomes in acute specialist units. The research design in this study was a meta-analysis and a systematic review of 35 articles that met the inclusion criteria. The main sensitivity outcome in this study was mortality rates. Driscoll et al. (2018) established that a high statistical significance exists between the nurse-patient ratios and patient outcome indicators. Therefore, a high nurse-patient ratio was associated with low mortality rates. High mortality rates in the critical care units were reported for a low nurse-to-patient ration of a high patient-to-nurse ratio.

Research by Kim, Kim & Lee (2017) investigates on achieving optimal nursing workforce and the associated financial costs. The authors analyze data from the Health Insurance Review and Assessment Service (HIRA). Through this data, Kim et al. (2017) establish the number of NAs, RNs, beds, and inpatients in the selected medical institutions. The authors measure the optimal nursing workforce using a workload model developed through the deterministic method. Factors considered when determining the required staff number include hours required for the coverage, holidays, vacations and absenteeism (Kim et al., 2017). According to Kim et al. (2017), the number of nurses needed for the entire coverage can be used as a coefficient for determining the optimal nursing workforce. The findings of this study show that the current nursing workforce has to be increased by 80% to achieve the required optimal level. The authors, therefore, conclude that the workload model is ideal for determining the optimum nurse-to-patient ratio.

In a subsequent study, He et al. (2016) conducted a longitudinal study to establish the relationship between nurse staffing and patient outcomes. According to He (2016), the leading threat to the US healthcare system is nurse understaffing. Increasing the nurse staffing levels is

associated with positive health outcomes such as a reduction in patient falls and pressure ulcers according to the data from the National Database of Nursing Quality Indicators® (NDNQI®.

Nurse Staffing Models

Two studies were found to discuss nurse staffing models used in various hospitals to improve patient outcomes. In the first study, Thériault et al. (2019) state that the staffing models are based on staff mix, resource levels, and team stability. For the conceptual model adopted in this study, the resource level staffing is based on patient-to-staff ratio, mandatory overtime and nurse workload. The staff mix approach is based on interdisciplinary, presence of support staff and type of personnel. Then on team stability, factors observed include staff mix, absenteeism and use of agency staff. The study adopted descriptive exploratory research to analyze a multidimensional framework applicable to nurse staffing. Four groups of nurse staffing were identified from the selected care facilities. The four groups are least resourced model, moderately resourced basic model, moderately resourced professional model and most resourced model. The final findings show that in 11% of the healthcare facilities, a lower patient-to-nurse ratio was the most resourced model. The ratio of patients to auxiliary nurses was another consideration for the multidimensional framework. The most resourced group generally consisted of a high percentage of registered nurses, with or without a bachelor's degree, few auxiliary nurses and average team stability (Thériault et al., 2019). According to Kutney-Lee, Sloane & Aiken (2013), increasing nurses with bachelor's degrees improves patient outcomes by reducing mortality rates. Hence, the staffing process should consider the level of education as one of the requirements for improving nurse-patient relationships.

In the second study, Hughes et al. (2015) investigated the approach used to determine nurse staffing requirements. The authors based their model on midnight census, and ADT Work

Intensity Index. The authors used a descriptive and comparative design involving 183 units selected from 32 hospitals. Each method of nurse staffing was used to calculate the ratio of registered nurses to patients. The results show that the midnight census does not account for the workload intensity of registered nurses. Therefore, the appropriate method of determining the required nursing staff is discharged and transfer adjustment to the midnight census.

Most of the studies selected focused on examining the relationship between nurse staffing levels and patient outcomes. The key variables or contextual factors examined are fall rates, hospital-acquired pressure ulcers, and mortality rates. All the studies examined supported that a high patient-to-nurse ratio contributes to negative patient outcomes. The observations made with nursing shortage include increase mortality rates, high rates of patient falls and increased incidence of hospital-acquired pressure ulcers among the patients. However, with a high nurse-to-patient ratio or a low patient-to-nurse ratio, the studies reported an improvement in patient outcomes with major observations including a reduction in mortality rates, pressure ulcers, and fall rates. Hughes et al. (2015) and (Thériault et al., 2019) also identify models used to address the issue of staffing nurses. However, these studies do not provide detailed information that can lead to development of an effective framework for majority of healthcare facilities.

Proposed Nurse Staffing Model

The outcome of the systematic review of different studies shows that the best model to address nurse staffing requirements is the nurse-to-patient ratio model or the workload model. In all the articles reviewed, the evidence shows that the number of patients should be the first determinant of the required nursing staff level. Kim et al. (2017) support the use of workload model in determining optimal nursing workforce since it factors the number of nurses needed for entire coverage, number of patients, absenteeism, and vacations. The recommended nurse-to-

patient ratio is 1:2. However, in most hospitals, this ratio is not achieved due to a shortage of staff nurses.

Summary

This section reports the process used to select appropriate studies as well as the outcomes. In this section, the studies analyzed have been summarized, with the major variables and themes identified. All the studies selected focus on the relationship between patient-to-nurse ratio and patient outcomes. All studies agree that a high patient-to-nurse ratio leads to negative outcomes such as high fall rates, increased hospital-acquired pressure ulcers, and mortality rates. Unfortunately, most of the studies reveal that a specific method for determining the level of nursing staff has not been established. Only two studies propose models that can help to identify nursing staff requirements. The considerations are based primarily on judgment, workload, and the number of patients. The model from the two studies applicable to staffing is the nurse-patient ratio model. More research is needed in this area to determine how this model can contribute to addressing nursing staff requirements.

Section 5: Application to Professional Practice and Implications for Social Change

Introduction

With this project, I aimed to develop a staffing model for informing sufficient staffing and management of contextual factors affecting the relationship between staffing levels and patient outcomes. I sought to address the existing gap in nursing practice, which is the lack of a multi-dimensional model for determining optimal and feasible staffing levels and moderating the effects of the staffing levels on patient outcomes. The main research question was: In the critical care setting, what is the multidimensional staffing model on the interaction between staffing levels and other contextual factors?

During the literature search process, 58 articles were identified; however, only 13 met the inclusion criteria. The findings of the articles reviewed show that a high patient-to-nurse ratio leads to negative patient outcomes such as high fall rates, increased hospital-acquired pressure ulcers, and high mortality rates. The findings also show that it is difficult to determine a specific framework that can help to address nursing requirements. Only two of the articles had information on the multidimensional framework that can be applied to identifying the level of nurse staffing needed in healthcare facilities.

Implications for Professional Practice

This systematic review has several implications for professional practice. First, the findings of the reviewed studies show that a high patient-to-nurse ratio is the main factor for poor patient outcomes. The nursing shortage is a key determinant of quality of healthcare services offered. The results, therefore, imply that increasing the number of nurses is a major step towards improving the quality of healthcare services. Second, the findings show that there is no specific

approach or a framework for staffing nurses. Therefore, nurse leaders need to understand the workload at their facilities and use their judgment to determine the level of staff nurses required to address patient needs. Finally, the findings can be adopted in future practice to help in establishing the effectiveness of workload model or nurse-to-patient ratio model in determining the optimal nursing workforce.

The study also has implications for the research methodology used in nursing. Systematic review does not lead to a collection of primary information. Therefore, nursing research should involve mostly randomized controlled trials and observations. These methods will aid in collection of experimental data that can help to create a framework for assessing the requirements for staffing nurses. For example, Kim et al. (2017) suggest that workload model is the best for determining the optimal nursing workforce. Future research should, therefore, provide an in-depth investigation into how the workload model can help establish the ideal number of nurses in emergency or critical care setting.

Positive Social Change

This systematic review has the potential to impact a positive social change at the individual, social and policy levels. At the individual level, increasing the number of staff nurses will help to address all patient needs, thereby promoting their health and wellbeing. Improvement in individual health will also indicate the wellbeing of the entire society. Last, the study can be used to encourage policy changes, especially on the level of nursing staff needed in each healthcare facility. The policy can offer guidance on the approach to use to recruit nurses and maintain the correct nurse-to-patient ratio. For instance, Kim et al. (2017) provide a detailed description of the methodology that can help in establishing the optimum nursing staff. An

increase in nursing staff, leads to improved access to healthcare, thereby improving quality of life.

Study Limitations

This systematic review was associated with several limitations. First, several studies did not have a clear description of a patient or hospital details. Therefore, it was difficult to establish if the patients were in critical or acute care settings. Second, only two studies had information on appropriate multidimensional frameworks for determining the level of staffing required in healthcare facilities. Finally, most of the studies selected had many participants (nurses or patients) and healthcare units. Therefore, chances of having researcher bias were high. The bias could have a negative impact on the outcome of this systematic review.

Recommendations

From the analysis, the best model for addressing nurse staff requirements is the nurse-patient ratio model or the workload model. Future research should focus more on collecting primary data that shows how this model can be improved and used to address nursing shortage. Through research, it will be possible to identify the effectiveness of the workload model in determining appropriate nursing staff requirements for hospitals. The research should also identify the best skill mix that can improve patient outcomes despite the high patient-to-nurse ratio (Thériault et al., 2019). For instance, the workload model proposed by Kim et al. (2017) can identify an appropriate skill mix for RNs, APNs and NPs needed to improve the quality of healthcare services.

Conclusion

From the systematic review of different studies, the best staffing model for nurses in a critical care unit is the nurse-to-patient ratio model. According to this mode, the number of

nurses in a critical care unit should depend on the number of patients. The recommended nurse-to-patient ratio as per the model is 1:2.   In this systematic review, 13 articles that met the inclusion criteria were analyzed. From these articles, it is was evident that a high patient-to-nurse ratio is associated with poor health outcomes such as increased falls, high mortality rates and a rise in hospital-acquired pressure ulcers. Therefore, this study shows the need to address the issue of the nursing shortage, although there is no effective policy or framework. From the 13 articles reviewed, only two have information that can help to develop a model.   The study has a positive implication to the professional practice since it shows how the nurse-to-patient ratio model can help to address the issue of nurse shortage and challenges encountered when determining appropriate nursing staff requirements. Future research should focus on how the nurse-to-patient ratio model can be improved and applied to many healthcare settings.

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Appendix: Summary Table

Study title, Author and date of publication	Problem description	Aim of the Study, Setting, and Sample	Study Design and Intervention	Results	Limitations	Conclusions	Level of Evidence based on the type of study	Quality rating based on the evidence provided
Nursing workload, nurse staffing methodologies, and tools: A systematic scoping review and discussion. Griffiths et al., 2020	There is weak evidence on the tools required to determine staffing requirements in acute hospital settings.	The study aims to give approaches that can be used to measure nurse staff requirements for acute wards in general hospitals.	A systematic review of literature.	Key approaches include professional judgment, patient prototype/classification, and patient to nurse ratios. The main tool identified is staffing assessment.	The authors did not critique some studies to draw appropriate conclusions.	There is still limited information or evidence on the correct tools for determining nurse staffing requirements.	Level III	Good quality
The effect of nurse-to-patient ratios on nurse-sensitive patient outcomes in acute specialist units: A systematic review and meta-analysis. Driscoll et al., 2018	There is a lack of clarity on determining appropriate nurse staffing levels other than the number of patients.	To determine the relationship between nurse staffing levels and patient outcomes in acute care. The setting is acute care units. The sample consists of patient receiving acute specialized care.	Systematic review and meta-analysis	35 articles, out of the 3429 identified were included in this study. The authors found that high nurse staffing levels resulted in a reduction in medication errors, mortality rates, pressure ulcers, and infections, which indicate positive patient outcomes.	Some studies reviewed had patients combined from non-specialized units. The calculation of NPR also had a high level of heterogeneity.	Nurse to patient ratio influences patient outcomes, particularly mortality rates.	Level II	Good quality
Nurse–patient ratios as a patient safety strategy: a systematic review. Shekelle, 2013	A small number of patients die shortly after hospitalization. It is possible to prevent these deaths with more nursing care.	To determine impacts of interventions used to increase the nurse-patient ratio on patient outcomes and mortality rate	A systematic review of literature. Nine longitudinal studies were reviewed.	Increasing the nurse staffing ratio reduces hospital-related mortality rates.	Researchers reviewed only 9 longitudinal studies, which makes it difficult to rely primarily on the results obtained.	Increasing the nurse-patient ratio leads to positive patient outcomes and reduces mortality rates.	Level II	Good quality
Intensivist/patient ratios in closed ICUs: a statement from the Society of Critical Care Medicine Taskforce on ICU Staffing Ward et al., 2013	Despite an increase in the number of ICU that offers critical care services, it has become difficult to provide quality care due to a shortage of staff.	To establish a maximum intensivist/patient ratio required in a critical care setting.	A systematic review of literature.	The quality of healthcare offered improves following an increase in the number of current intensivist and staff nurses. High staff turnover decreased the quality of care indicators in the critical care setting.	The study focused primarily on a literature review and some of the studies used did not have a clearly described methodology.	A common-sense approach should be applied to determine the optimum number of patients each intensivist should care. Important principles should also be applied.	Level III	Good quality

Are high nurse workload/staffing ratios associated with decreased survival in critically ill patients? A cohort study. Lee et al., 2017	Exposure to inadequate staffing ration/workload in ICU settings contributes to high mortality rates	The authors sought to establish a threshold for workload/staffing ratio that can reduce the probability of patient survival in ICU and show the relationship between exposure to inadequate staffing and survival chances. The setting was ICUs in a district hospital and a university teaching referral hospital. The sample consisted of patients admitted to ICU hospitals in Hong Kong.	The design was a retrospective analysis of collected data. The intervention used was the Therapeutic Intervention Scoring System.	The analysis involved 894 separate admissions. The findings show that the probability of surviving after discharge was 90% when the workload –to nurse ration is <40. The probability increases to 95% when the workload to nurse ratio is >52.	The study was primarily observational, hence it was not easy to establish a causal relationship between workload/staffing ratios and hospital survival	A high workload/staffing ratio reduce the odds of patient survival.	Level II	Good quality
Nurse staffing and patient outcomes: a longitudinal study on trend and seasonality. He et al. (2016)	Nurse understaffing is among the leading threats to patient safety in most of the US hospitals. The current research on the relationship between nursing staff and patient outcomes is still incomplete.	To examine the longitudinal relationship between nursing staff and patient outcomes.	The research design was a longitudinal study of the National Database of Nursing Quality Indicators® (NDNQI®) data collected between 2004 and 2012.	Higher staffing leads to improved patient outcomes (reduction in fall rates and pressure ulcers).	The authors analyze only existing data without considering other variables likely to influence the outcome.	Changes in nursing staff are inversely associated with changes in patient outcomes – pressure ulcers and patient falls.	Level IV	High quality
Care left undone during nursing shifts: associations with workload and perceived quality of care.	The main source of worse patient outcomes is lower nursing staff levels. Low mortality rates.	The aim of this study is to examine the relationship between nursing staff levels and missed care episodes as well as	A cross-sectional survey design was used. Questionnaires were then distributed	A low nurse to patient ratio contributed to missed care.	The survey method used focuses mainly on nurse's perception of the amount of work undone depending on the number of shits.	Nursing shortage and a high workload contribute to a low quality of care.	Level IV	High quality

Ball et al. (2014)		quality of care and patient safety environment. The study was conducted in wards in selected healthcare facilities. The sample consisted of 2917 registered nurses working in 401 wards.	to collect data.				
Hospital nurse staffing and staff-patient interactions: an observational study. Bridges, Griffiths, Oliver & Pickering, 2019	According to the existing evidence, reducing nursing staff and skill mix as well as substituting assistant personnel for registered nurses affects the quality of care. Previous studies failed to show how nurse staffing relates to staff-patient interactions.	The study explores the relationship between nurse staffing levels, skill mix and quality of care. The intervention entails observation data using Quality of Interaction Schedule.	The study design is a secondary analysis of observational data.	A low number of staff nurses reduced the interaction between nurses and patients. RN and HCA nurse staffing levels determined the rate of interactions per patient.	It is difficult to make a causal inference on the study because it is primarily observational.	Low RN staffing affects negatively the interaction between patients and staff.	Level II	Good quality