How Many Hours is it Safe for a Nurse to Work?

Peter Walsh

Anna Maria College

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Professor Craig Blais

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Abstract

The objective of this study is to explore nurses' perceptions about how working long hours affects their level of fatigue. Contemporarily, nurses have been working longer and longer hours due to the nursing shortage and the Covid-19 pandemic. There are potential consequences that may result from working while fatigued. The question this study seeks to answer is: are nurses who are limited to 8-hour shifts at decreased risk for making patient care errors, compared with nurses who do not limit their hours and work 12-16 hours throughout the workday? This study was conducted via an online survey with 10 Likert scale questions, and 2 interview questions. Results show increases in the perception of fatigue and factors relating to fatigue in participants who have worked up to 16-hour shifts. As nurses work more hours consecutively, their perception of being fatigued increased. Working more than a regular shift may perpetuate behavior that increases the risk of making a patient care error. However, despite working long hours, some nurses still attempt to uphold a standard level of care.

Chapter One: Introduction

In the world of health care, patient care errors are a high priority of concern. There has been an increased interest in the number of patient care errors in health care, and studies have found shocking evidence of widespread medication errors. We rely on trusting our health care providers to provide safe and effective health care; however, patient care errors disrupt this relationship. The World Health Organization (WHO) states that adverse events related to unsafe care are a top 10 cause of death globally (WHO, 2019). Annually, 134 million adverse events occur in hospitals in low/middle-income countries, resulting in 2.6 million deaths. About 2/3 of all adverse events resulting from unsafe patient care occur in low/middle-income countries (WHO, 2019). Globally, 4 in 10 patients are harmed in primary and outpatient care, and 80% of this harm is preventable (WHO, 2019). In high-income countries, 15% of hospital activity and expenditure result from adverse events (WHO, 2019).

In the United States, there continues to be this ongoing healthcare-related problem of preventable patient care errors that often cause harm to patients. These errors are widespread throughout the country and have been a target of education in schools that produce health care workers. One study shows that 400,000 deaths are caused by medical error alone every year in the United States (Da Silva, 2016, p. 4). Another study estimated this number to be 251,000 deaths annually and account for 9.5% of all deaths, making deaths from medical error the third leading cause of death, behind heart disease and cancer. This number is up from 45,000-98,000 deaths annually reported by the institute of medicine in 1999 (Anderson, 2017, p. 1). The food and Drug Administration receives 100,000 reports annually regarding medication errors, which could potentially cause death, life-threatening situations, hospitalization, disability, and birth defects (Food and Drug Administration, 2019).

The data for Massachusetts is unnerving. In 2017, almost 62,000 preventable and potentially harmful events occurred, costing $617 million in additional health care insurance claims. Most respondents of this study expressed dissatisfaction with the way their health care providers communicated with them after the error had occurred (Betsy Lehman Center for Patient Safety, 2019, p. 1). Thirty-seven percent of individuals who experienced an error 3-6 years ago still avoid medical care due to the experience (Betsy Lehman Center for Patient Safety, 2019, p.12). About one in four (23%) Massachusetts residents have been involved in a medical error situation (Harvard School of Public Health, 2014, p. 4). Various types of medical errors experienced often in Massachusetts include misdiagnosis (51%), wrong test/surgery/treatment (38%), wrong/unclear follow up instructions (34%), incorrect medication dose or drug (23%), and infections resulting from a test/treatment/surgery (32%). Women are more likely to report medical errors (Harvard School of Public Health, 2014, p. 5). The negative emotional impact of these medical errors can persist for years (Prentice et al., 2020, p. 883).

Recently in Massachusetts, there has been an increase in discussion regarding unsafe situations in hospitals and nursing homes. An example of this is the recent strike at St. Vincent Hospital organized by the Massachusetts Nurses Association (MNA) through which nurses are advocating for safer staffing for nurses and patients alike (Massachusetts Nurses Association, 2021). Anecdotally speaking, conditions in Massachusetts's healthcare facilities have bred an environment that can result in more patient care errors. Nurses are working longer, have more patients, and are under tremendous stress due to the Covid 19 pandemic. Commonly discussed are the topics of burnout, fear of losing one's nursing license in anticipation of making a medical error, and the fatigue that working so many hours can cause. Fatigue is a prevailing topic throughout the Covid 19 pandemic.

Statement of The Problem

Patient care errors by nurses can result from several areas. These areas are all interrelated, and all accumulate toward a patient care error occurring. These areas of concern include nursing fatigue, consecutive hours worked, and the nurse's environment.

Fatigue and patient care errors.

The information regarding fatigued nurses and the patient care errors that result is numerous. Fatigue has always been a limiting factor of productivity, and adequate rest to reduce fatigue is necessary. But what happens when fatigue accumulates in the health care setting? One study found a significant association between psychological and functional status in healthcare workers and the occurrence of cognitive medical errors (Alyahya et al., 2021, p. 426). A study regarding missed vital signs found 53% of observations were significantly delayed, and 44% of observations were missed in nursing staff who worked more than 12 hours (Dall'Ora et al., 2019, p. 3). A qualitative cross-sectional study showed that self-reported quality of care is higher in nurses that worked 8 hours or less, the odds of poor quality of care is 1.64 times higher if nurses worked 12 or more hours, and care left undone was highest in nurses working >12 hours (Ball et al., 2017, p. 1). The evidence that fatigue leads to patient care errors expresses the need to explore what is causing the high levels of fatigue in nurses. Two causes include consecutive hours worked and the environment that the nurse is working in.

Consecutive hours worked.

Health care, especially nursing, is notorious for individuals working 12 or even 16-hour shifts. These long shifts can have detrimental consequences to patient care. Several studies show how consecutive hours worked result in a higher level of fatigue in nurses. A recent systematic review of 19 studies shows that working more than 12-hours per shift and 40-50 hours weekly

significantly increases the risk for making medication errors, and working more than 12 hours per shift negatively impacts employee fatigue, health, work satisfaction, and patient safety (Di Muzio et al., 2019, p. 4517). A dissertation from a Boston College graduate student concluded that workload and work hours were statistically significant predictors of fatigue in nurse anesthetists (Emery, 2013, p. 80). Another study shows that fatigue is objectively measurable and increases with subsequent 12-hour shifts (Thompson, 2019, p. 12). It is important to note that there has been a staffing shortage because of the Covid 19 pandemic, leading to more nurses picking up long shifts.

Environments resulting in patient care error.

Even if not considering the context of nursing, it is common knowledge that the more there is to do in a short amount of time, the more likely mistakes are likely to happen. In any job in which an individual must multitask with several difficult tasks, errors are often imminent. In nursing, this is no different, and when human lives are subject to mistakes, it is apparent how work environment can lead to patient care errors. Di Muzio et al. (2017) also found that increased workload, decreased staffing, and working nightshifts increase the risk of making a medication error (p. 4517). A study involving hemodialysis units shows that high patient-to-nurse staffing, workload, and resulting care left undone are key contributors to lower overall safety ratings (Hawkins, C. T., Flynn, L., & Dillon, J., 2020, p. 141). A study about nursing workload in intensive care units (ICUs) shows that nurse workload in ICUs appears to be relatively higher for nurses whose patients die compared to patients who survive (Fasoi et al., 2020, p. 11). It is important to consider the environment because nurses must concentrate, calculate doses, read orders correctly, and measure medication correctly. Anything that interrupts a nurse's work can lead to patient care errors.

Summary.

Because these areas of concern are all interrelated, many studies focus on more than one of these areas. For example, some studies might describe how consecutive hours worked lead to fatigue. Another study might describe how fatigue leads to more patient care errors. Still another study might describe the effects of hours worked and work environment and emphasize the impact on patient care errors, with fatigue as a side discussion. Workload may lead to more hours worked, and fatigue may lead to a workload being too much. The issue is very complex, and it is apparent that it is hard to fix.

Background and Need

Some solutions have been identified for the problems previously described; however, they often are not taught or used in the health care setting. Each nurse's experience is different, and therefore there is no one size fits all intervention to eliminate the problem experienced. Researchers may provide recommendations, but they are not necessarily tested or feasible.

Fatigue and patient care errors.

The goal of reducing fatigue that leads to patient care errors is multifactorial. There are different strategies that can be used to reduce fatigue levels in nurses. Lim et al. state that "individual nurses should develop healthy lifestyles to reduce occupational stress and alleviate sleep disorders" (2018, p. 1538) in response to nursing fatigue. Reduction in occupational stress and high-quality sleep could reduce fatigue in nursing working long shifts. Ose et al. state that continuous dynamic assessment of the most suitable shift length should occur because there is no universal shift length that has been decided as optimal (2019, p. 10). These suggestions are vague and do not provide much guidance on the issue of how many consecutive hours a nurse should work. There is more research that must be done in this area.

Environments resulting in patient care error.

Some things can be done to mitigate error related to these high stress and workload environments. Alyahya et al. suggest that a decrease in nurse/doctor to patient ratio is necessary to reduce the occurrence of medical errors (2021, p. 427). Decreasing patient ratio relieves the nurse of these responsibilities, making for an easier workday. Di Muzio et al. states that a strategy to address fatigue is to guarantee sufficient rest and allocate work in line with the expertise and function of nurses (2019, p. 4518). Providing the nurse with a realistic and fairly distributed workload will allow them to focus on the patient and the task at hand. Hawkins et al. state that patient safety outcomes can be enhanced by ensuring adequate RN staffing and reasonable workloads, and modifying nursing responsibilities so they can complete necessary/important care activities (2020, p. 141). Nurses must take care of the most important priorities, and this includes preventing patient care errors. So, modification of their workload is important. This is easier said than done however.

Consecutive hours worked.

Many researchers point to the obvious in this area of concern: work fewer hours. Although there is much information regarding working more than 8 hours, there is not much information about patient care errors and working 8 hours or less. Thus, the only intervention specific to consecutive work hours is to work fewer hours, and this is based on inference. More research is needed in this area.

Summary.

The interventions described for these three areas of concern are not enough to reduce patient care errors. The problem of patient care error is widespread despite nurses finding ways to handle fatigue that they encounter. Because there is little research in fatigue reduction

strategies, reduced workload, and reduced work hours, these are all subject for future

research. Qualitative information regarding nurses' lived experience of their level of fatigue is

lacking, and this is a particular topic that requires investigation.

Purpose of the Study

The purpose of this study was to explore the lived experience of nurses who have worked

shifts longer than 8 hours to identify levels of fatigue and subsequent consequences for nurses.

Nurses who work more than 8 consecutive hours are at risk for a higher level of fatigue, and

therefore more susceptible to making patient care errors. These patient care errors account for

millions of deaths globally, hundreds of thousands of deaths in the United States, and thousands

of deaths locally in Massachusetts. Reducing the number of hours worked may mitigate this

issue and result in fewer patient care errors, harm, and death.

A qualitative data collection tool was developed for this study. The researcher provided a

questionnaire containing 10 Likert scale questions and two transcribed interview questions about

hours worked, fatigue, and patient care error, as well as demographic data to complete. This

survey was administered on social media platforms via a link to an electronic form. The expected

outcomes of this study are that nurses who work 12 or more hours will report a higher level of

fatigue and that nurses who report a higher level of fatigue will also report reduced quality of

care and apprehension about making a patient care error. The specific research question this

study attempts to answer is: are nurses who are limited to 8-hour shifts at decreased risk for

making patient care errors, compared with nurses who do not limit their hours and work 12-16

hours throughout the workday?

Significance to the Field

After review of the current literature, a lack of studies and research that use a qualitative design in the manner that this study has was found. The findings of this study are significant to the nursing field, as it provides data from nurses that have been working during the Covid 19 pandemic, who have also experienced working more hours, having less staff, and an increased level of stress. All of these factors are in combination with the stressful nature of the nursing profession. The results of the study should reflect an increased level of fatigue and an increased concern for patient care errors. The findings of this study can supplement background information for future research implementations to reduce nursing fatigue and prevent patient care errors, as well as identify areas that lack in research. Therefore, reducing medical errors among nurses working more than 12 hours consecutively would improve patient outcomes.

Definitions

Medical error: "a medical error is a preventable adverse effect of medical care, whether or not it is evident or harmful to the patient." (Carver, 2021).

Medication error: "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer" (Food And Drug Administration, 2019).

Missed nursing care: "missed nursing care, conceptualized within the Missed Nursing Care Model, is defined as any aspect of required patient care that is omitted (either in part or in whole) or delayed." (Kalisch, Landstrom, & Hindshaw, 2009).

Nursing Fatigue: "A subjective feeling of tiredness (experienced by nurses) that is physically and mentally penetrative. It ranges from tiredness to exhaustion, creating an unrelenting overall condition that interferes with individuals' physical and cognitive ability to function to their normal capacity" (Canadian Nurses Association, 2012).

Quality of care: "quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes" (WHO, 2021).

Sentinel event: "a sentinel event is a patient safety event that results in death, permanent harm, or severe temporary harm" (The Joint Commission, 2021).

Shift work: "the term shift work refers to any work schedule that falls outside the hours of 7 am and 6 pm" (Pacheco, 2020).

Limitations

One limitation to the study is the lack of a control group. There is no group that has worked 8-hour long shifts compared to 12 or more-hour long shifts. Lack of a control group reduces the internal validity of a study. Another limitation to this study is the small sample size. Having a small sample size limits the external validity of the study by making it less appropriate to generalize a population of nurses with this study. Having a sample size of hundreds of nurses would make this study more applicable to the general population. Recruitment of participants used for the study depends on purposive sampling and relies on nurses completing the survey by chance. Lack of funding is another limitation. There was one researcher with no funding, so all parts of the study were made by the researcher, and conducted by the researcher, taking away time from each portion of the process. Finally, the study does not directly ask about specific medication errors and patient care errors. The researcher chose to omit this type of question for ethical reasons. After receiving education about ethical research from the Association of Clinical Research Professionals (ACRP), the researcher proposed this study and received approval from the Institutional Review Board (IRB) at Anna Maria College. Approval required a proposal, a copy of the data collection tool, and a copy of the solicitation to complete the survey.

Ethical Considerations

Ethical considerations for this study include the participant's psychological wellbeing. The questions in the questionnaire may invoke strong emotions and apprehension that speaking of medical errors and work performance will be used against the participant. The survey provides information about anonymity and informs the participants that data is anonymized. The survey does not ask for identifying information. The survey states that the researcher will not use information in the study to report, reprimand, harass, coerce, or perform any form of disciplinary action related to the study.

Chapter Two: Literary Review

The amount of patient care errors that occur globally remains concerning within the health care community. It appears that many of these errors occur in low- and middle-income countries; however, high-income countries still experience errors and the negative consequence that comes from them. Because health care is such a large portion of the economy, the billions of dollars spent on errors in the United States alone tax the health care system. In Massachusetts, a state that is commonly praised for the quality health care that is provided, the issue of patient care errors remains shockingly high, and the vernacular of many health care facilities and schools that produce health care workers consists of worry about patient safety, and unsafe conditions that risk licensure. Talk of strikes and quitting are commonly heard among individuals who work in health care. As the current nursing shortage worsens, nurses are working more and more hours, in more taxing work, with less and less staff. The additional stress of the Covid-19 pandemic adds to this problem. The current study has a great opportunity to explore whether more consecutive hours worked leads to a significant level of fatigue that results in patient care errors.

The literature review addresses the three previously explored areas of research. The first section addresses fatigue patient care errors and possible interventions to reduce fatigue among nurses. The next section addresses consecutive hours worked and the fatigue that results, as well as the lack of studied interventions regarding this problem. The third section addresses the work environments that result in more fatigue and patient care errors and the possible steps that managers can take to improve workflow and reduce the risk of making patient care errors.

Fatigue and Patient Care Errors

As a nurse becomes more fatigued, the ability to concentrate, think critically, and perform suffers. When these aspects of a nurse's care decline, the ability for the nurse to provide safe and high-quality care diminishes. The extent to which fatigue increases the risk for patient care errors is explored in these studies. The relevance of the data collected to the fatigue aspect of the current study is also examined.

Despite increased attention, medical errors are one of the most significant health problems globally and present a major challenge for the health care system. Both organizational factors, and psychological/cognitive factors are responsible for medical errors occurring. Exploring these factors and their influence on medical errors is an important consideration in identifying the cause of patient care errors. The purpose of the first study to be examined is to investigate the association of cognitive medical errors with a hospital's organizational factors, workload, stress, sleep and fatigue (Alyahya et al., 2021). The study was conducted in three main hospitals in Northern Jordan. Hospitals were selected using criteria including representation of different health sectors, provision of general health services, and being central/large hospitals. The participants included registered nurses and physicians working in clinical departments of the three hospitals. Four hundred health care providers, consisting of 284 nurses, 76 physicians, and

40 heads of department, participated. Participants were both male and female, aged 31-40. About

thirty percent of participants had work experience between 6 and 10 years (p. 418-419). The

study did not include an intervention; however, it used a survey to explore four main sections:

demographic data, information about medical errors, hospital organizational factors, and

psychological/functional factors (p. 418).

     A pilot study was conducted and received positive feedback. The researchers obtained

permission from hospital department heads, and a survey using a 5-point Likert scale was

distributed. Data collection took place during different times of the day and took about 20

minutes to complete. The study was conducted between July and October (p. 418). Variables that

the Likert scale questionnaire measured include medical errors and their causes, organizational

safety culture, organizational blame culture, policies and procedures, workload and complexity

of tasks, stress, sleep, and fatigue. Several methods of data analysis were used to organize the

data. For each variable, varimax and principal component analysis and Statistical Package for

Social Sciences (SPSS) version 21 were used. Kaiser-Meyer-Olkin values were determined for

all variables. Bartlett's Test of Sphericity was statistically significant. Exploratory factor analysis

and Cronbach's Alpha were also used. Multigroup analysis was conducted to examine

differences in participants' perceptions of the variables (p. 418-245). The results of the study

show a non-significant negative association between medical errors and hospital organizational

factors. Enhancing organizational culture would encourage a safety/no-blame culture and would

improve the occurrence of medical errors. There is a significant positive correlation between

healthcare professionals' psychological and functional status and the occurrence of medical

errors. Predictors of medical errors include excessive workload, fatigue, stress, sleep deprivation,

and complexity of tasks. The factors contributing to medical errors are due to deficiencies in

cognitive performance (p. 425-426). The study concluded that hospitals need to enhance

organizational culture, encouraging safety and no-blame culture, focusing on both organizational

and individual levels. Decreasing nurse to patient ratio is another step towards decreasing

medical errors. Health care providers need to be made aware of the importance of complying

with policies and procedures and using up-to-date instructions to provide care that reduces the

need for memory (p. 427). An implication of the current study is the identification of the cause of

this fatigue that results in medical errors. The current study examines if consecutive hours

worked to result in a higher level of fatigue. There are several limitations of this study. The study

used convenience sampling, which may not represent all of the health care workers in Northern

Jordan. There was an uneven number of nurses and physicians, and results may be skewed by not

having a participant population consisting of only nurses. The use of a self-administered

questionnaire is another limitation for this study because bias, reporting of information, and

subjective discrepancies may influence the participant's response (p. 426-427). The current study

consists of all nurses; however, using a self-administered questionnaire and random sampling

remains a limitation.

　　　　Nursing shifts that last 12 hours or more are becoming more popular. There are perceived

benefits to working 12 or more hours, including reducing overlapping shifts and more efficiency.

This has not been proven, and in fact, nurses may need to pace themselves to make it through the

shift, reducing productivity. The aim of the next study is to measure the association between

nurses working at least 12 hours and objective measures of missed care in the form of vital sign

observations taken on time (Dall'Ora et al., 2019). The study took place in 32 general inpatient

wards at a large acute hospital in England (p. 1). The measured subject of the study includes

658,628 nursing shifts observed through electronic records. The patient sample consisted of all

patients who were on the hospital wards during the timeframe included in the analysis. The

nursing sample consisted of registered nurses and unregistered health care assistants (pp. 1-2).

Nurses and aids working 12 hours or more shifts were monitored for missed or delayed vital sign

observations (p. 1). Records of nursing shifts were collected from hospital-wide electronic

rostering systems. Vital sign observations were derived from records in the VitalPac system.

Vital sign observations were classified as delayed or missed. Records from April 2012-March

2015 were obtained. The variables monitored were the vital sign observations and whether they

were on time, delayed, or missed by a nurse who worked 12 hours or more (p. 2). Data analysis

included descriptive analysis, The Pearson Correlation, linear mixed-effects Poisson models, as

well as other statistical calculations (pp. 2-3). The results of the study show that 53% of vital

signs were delayed in high-acuity patients, and 44% of observations were missed. Delayed and

missed vital signs were associated with support staff. However, for registered nurses, it seems

there is no significant association between hours worked and delayed/missed vital signs (p. 3).

The researchers conclude that further research should be conducted to explore better measures of

job performance, and more data is needed to work out which shift patterns are the most cost-

effective forwards (p. 5). Because further research is necessary for this area, the researcher's

current study could identify qualitative perceptions regarding missed care, which is lacking in

this study. This study has several limitations. Only vital signs were focused on, which may not

reflect performance entirely. Responsibility to obtain vital signs was not established, so the

researchers did not know if the nurse or the support staff were responsible for observing vital

signs. It was impossible to know if a delayed or missed vital sign was a purposeful decision of

the nurse/support staff. Patients also may have been unavailable at the time of vital sign

observation, which would not count as a missed or delayed observation. The consequence of

missed/delayed observations was unknown. The study was conducted on a single site, which may not be applicable to other sites. Demographic data of the nurses were not obtained, which may be another variable on job performance (pp. 4-5).

In England, there has been an increase in nurses working longer shifts for various reasons; however, concern about patient safety has also been a topic of discussion. The third study in this research area examined aims to establish if there is an association between shift length and job satisfaction, satisfaction with work flexibility, quality of care, patient safety, and care undone (Ball et al., 2017). The sample of the study consisted of registered nurses in medical and surgical wards from 400 wards and 46 acute hospital sites (p. 3). Data from a questionnaire asking questions regarding practice environment, staffing, number of patients, quality and safety measures, frequency of adverse events, care left undone, job dissatisfaction, and shift length was administered in the spring/summer of 2010. 2,917 participants responded to the survey (p. 3). Variables include poor quality of care, poor patient safety, job dissatisfaction, work schedule dissatisfaction, and care left undone (p. 3). Data analysis included multi-level regression models, a multi-level logistic model, and a multi-level Poisson model. Results show that self-reported poor quality of nursing care was lower in nurses working 8 hours or less, compared with those working longer hours. Shift length was significantly associated with poor quality of nursing care. The odds of poor quality of care was 1.64 times high for nurses working 12 or more hours, compared to nurses working 8 hours. Safety ratings were of similar behavior; however, the difference is not significant between 8 and 12+ hour shift length. Care left undone was highest among nurses working 12 or more hours, and job dissatisfaction varied but increased with shift length. Dissatisfaction with flexibility was not significant across shift lengths (pp. 3-5). The researchers conclude that future research should focus on how 12-hour shifts can be optimized to

reduce potential risks and that nurse managers have a difficult decision regarding allowing employees to work 12 or more hours. In the absence of a complete picture, nurse managers should proceed with caution (p. 6). The current study should complement the quantitative data listed in this study with qualitative data in the same manner. This study has limitations, including a cross-sectional design, subjective interpretation of outcome measures, single item questions for complex topics, the difference in working patterns, and only accounting for shift length without regard to breaks and overtime (pp. 5-6).

The three studies outlined for fatigue and patient care errors show that increased fatigue does indeed lead to a higher amount of patient care errors. Cognitive medical errors, vital sign observations, and care left undone were all affected by fatigue, as evidenced in the studies. Researcher recommendations may alleviate some fatigue; however, they are very complex, and the need for further research still remains. The current study has a role in reinforcing this idea that fatigue leads to patient care errors in a qualitative design. Unfortunately, many of the same limitations found in these studies persist in the current study, including self-administration of a questionnaire, random sampling, lack of direct observation, and subjective interpretation of questions.

Consecutive Hours Worked

Hours worked, and their relation to fatigue is important to factor in the occurrence of medical errors. The tendency for nurses to work longer shifts for various reasons perpetuates this issue. Nurses have the ability to work fewer hours to an extent. Unfortunately, mandating nurses to work 16 hours does happen, and the issue is becoming worse with the current nursing shortage in the United States.

Human errors are inevitable in the health care system. No one is perfect, and without proper interventions, these errors continue to happen. Working consecutive hours jeopardizes patient safety, especially for the vulnerable inpatient population. The first study in this area of research aims to analyze the correlation between clinical risk management and the occurrence of medication errors and the effect of shift work on inpatient nurses (Di Muzio et al., 2019). The study did not have participants, as it is a systematic review of various other studies that exist. Various inclusion criteria for the study are outlined: intervention studies, observational studies, papers reporting administration of medications by registered nurses, studies performed in hospitals/inpatient settings, studies focusing on adult and pediatric patients, and peer-reviewed research articles published in English and Italian (p. 4508). Shift work is the main focus of the study. Studies were selected based on criteria, the data in the studies was extracted, the studies were assessed for quality by using the Grading of Recommendations, Assessment, Development, and Evaluations method (p. 4508). Variables included shift work, work organization, sleep quality, sleep quantity, fatigue, and errors (pp. 4514-4516). Data extraction consisting of the author, year of publication, study purpose, study design, population, and findings summary was used to organize and analyze the data (pp. 4508-4513). Findings of the research include emphasis that the number of medication errors increases proportionally to long hours. Working more than 12 hours per shift and working more than 40-50 hours per week is related to more medication errors. The risk for medication errors increased by 2% for every extra hour of voluntary work. The risk of error significantly increases when shifts are longer than 12 hours. There is a negative impact in terms of fatigue, health, satisfaction, work/family balance, and patient safety when employees work longer than 12 hours (p. 4517). The authors conclude that the main reasons for medical errors are stress, fatigue, increased workload, night shifts, and interruptions in workflow.

Tiredness and lack of rest are critical in medication error risk (p. 4518). The risk for medication errors with shift work has been discussed within the population that this researcher has studied, so results should provide qualitative data regarding this concern. The study has some limitations. There is no intervention, and the results are derived from other studies that have been performed. This makes the validity of the systematic review no more than the limitations of the studies that it has examined. There could be variables unknown to the authors, which could skew results. Various types of studies were examined, and the summation of data is from various settings, populations, locations, etc. Therefore, it is difficult to apply all data to all situations in health care.

The intense workload of nurse anesthetists obviously results in much-accumulated fatigue due to the nature of the job and the hours worked. A dissertation by Emery S examines the effect of work hours/workload on fatigue in nurse anesthetists. Specific questions include to what extent do hours of work/workload explain post-shift fatigue and whether there is an interaction of work hours/workload on post-shift fatigue (2013, p. 6). The study was an email solicitation sent to certified/recertified nurse anesthetists' members of the American Association of Nurse Anesthesiology (AANA). (p. 50). 60% of respondents were female, 40% were male. The respondents consisted of various education levels, including master's degree and doctoral educated. Some possessed a certificate of anesthesia, and some had a bachelor's degree. There were 928 participants in the study (p. 61). A questionnaire called The CRNA Work and Fatigue Survey was used to collect data. It contains 47 questions and includes demographic data, individual strength, fatigue measure, and NASA Task Load Index (p. 51). Approval from Boston College was obtained, a pilot study was conducted, and the survey was sent via email to participants. The survey was open from April 30, 2012 to May 25, 2012 (p. 50). Independent

variables included work hours and workload using the NASA Task Load Index, a measure of

workload. (p. 51) and dependent variables include fatigue and answers on The Checklist of

Individual Strength questionnaire, an instrument that measures fatigue (p. 53). The American

Association of Nurse Anesthesiologists managed the survey and provided the researcher with an

excel sheet with the survey responses. Data was entered into the SPSS version 19.0. Descriptive

statistics were computed on all variables and further examined for missing data. Missing data

was replaced with mean substitution (p. 56). Results show that nurse anesthetists who worked

more hours and experienced greater workload reported a significant increase in levels of fatigue

(p. 71). There was also a non-significant interaction between work hours and workload (p. 72).

The researcher concluded that the results are similar to previous researchers' works showing that

longer workdays are associated with greater fatigue (p. 83). Mental workload is more significant

to fatigue than physical workload (p. 84). Women are more likely to experience fatigue than men

(p. 86). Because nurses are involved with higher levels of mental work rather than physical work

(experienced the most by nurse assistants), there is more reason to suspect that longer work hours

will accumulate more fatigue. Therefore, results from the current study are likely to present a

correlation between hours worked and fatigue. The researcher's study has limitations. The

response rate was lower than expected, potentially caused by an electronic technical problem,

survey length, and/or bias. The survey was long, and questions regarding topics such as sleep and

family responsibilities had to be omitted from the survey due to this. Participants may have had a

bias in completing the survey, fearing their long hours may be jeopardized by the results. The

survey used self-report, which has inherent inaccuracies. The time of the response could not be

controlled, and participants responded at various times in relation to them working. Work-load is

a difficult concept to define. "Hours of anesthesia care" was left open to interpretation, and some participants may interpret this as including different amounts of time, skewing the results.

While hours worked are an important consideration for the development of fatigue, there is a lack of information about working consecutive days as a nurse. The researchers of this next study desired to explore the "dose-response" effect of working consecutive shifts. This would outline whether or not performance declined toward the end of a string of long shifts or not. The purpose of the study was to compare the effects of a single nursing work shift to three compressed 12-hour shifts on performance-based fatigue in both nurses and nurse aids (Thompson, 2019). The study sample consisted of nurses employed at local hospitals within 25 miles of the researcher's university. The sample included 16 registered nurses, 8 certified nurse assistants, and 2 licensed practical nurses, from 18-62 years old (p. 5). Participants were selected from a sample of hospitals in Northern Utah (p. 12). All participants were either a registered nurse, licensed practical nurse, or a certified nurse assistant working full time. Participants had to be free of neuromuscular diseases, sleep disorders, or other stated diseases/health issues (pp. 4-5). The participants were to work three 12-hour shifts in a row. The participants were examined on four occasions. The first visit was to debrief, confirm work schedule, and familiarize the participants on the performance tests. The second visit was scheduled with 24 hours of the first work shift. The third visit was scheduled immediately after the first work shift. The fourth visit was scheduled immediately after the third work shift. The participants were instructed not to exercise and to not work for 48 hours prior to the second visit (p. 4). Reaction time, vertical jump height, and various strength assessments were measured (pp. 4-5). ANOVAs were used to measure differences in variables across visits. Other analyses include Bonferroni adjusted pairwise comparisons, Cohen's d statistics, and SPSS statistics where an alpha level of $P < 0.05$

is considered statistically significant for comparisons (p. 5). Results of the study show that fatigue-based impairments in various performance-based tasks were present after a single 12-hour shift, and fatigue was more prevalent in some of these tasks after working three consecutive 12-hour shifts (p. 8). There was a moderate increase in lapses of attention after one 12-hour shift and a five-fold increase after three consecutive 12-hour shifts (p. 10). The researcher concludes that fatigue is objectively seen in nurses working 12-hour shifts. Nurse staff, managers, and administrators should consider strategies to reduce fatigue (p. 12). Because the population the current study seeks to answer works multiple long shifts, similar trends may be seen. This study has a lack of a control group, which provides no baseline to compare results to. The study included only females in a specific sample of hospitals, which may decrease the ability to apply the data to other populations. The researcher took some precautions anticipating the limitations of the study. Restricting exercises and work 48 hours prior to the second visit ensured that fatigue did not accumulate from past shifts and extraneous factors (p. 12).

The three studies outlined for consecutive hours worked show that working more than 12 hours consecutively has an effect on fatigue and subsequent medical errors. This is shown in a systematic review and in a dissertation regarding nurse anesthetists, and fatigue seems to accumulate with additional 12-hour shifts worked. There is not much that can be said for intervention other than to work fewer hours. There is a lack of information when it comes to reducing hours worked. The current study specifically focuses on consecutive hours worked, so qualitative data should parallel the quantitative data seen in these various studies. Similar limitations exist in the current study, including having no intervention, variables unknown to the researcher, and lack of control of demographics in the sample.

Environments Resulting in Patient Care Error

The environment that a nurse works in must be considered when discussing the cause of patient care errors. When a nurse needs to properly calculate important medication doses, keep a patient from falling and hurting him/herself, and ensure a patient is properly discharged all at once, mistakes can be made. Placing too much responsibility on one nurse is often a major factor in honest mistakes occurring.

Hemodialysis units are home to vulnerable patients. Patients with kidney issues tend to be sicker and have a lot of issues that can change their condition. This is a particular population in which patient safety is emphasized. Unfortunately, we see patient care errors occur in this environment as well. The first study for this area of research to be examined seeks to examine interrelationships between registered nurses and staffing, workload, care left undone, and patient safety outcomes in the hemodialysis setting (Hawkins, Flynn, & Dillon, 2020). The study took place via email solicitation to 800 registered nurses who work in nephrology settings. One hundred and four nurses who identified themselves as registered nurses working in hemodialysis were used for the study. The sample consisted of 84 female and 20 male registered nurses. The sample contained multiple races, although the majority was white/Caucasian. Various education levels were held by the participants. 84 participants worked in a chronic hemodialysis unit, and 20 nurses worked in an acute hemodialysis unit (pp. 134-135). A survey was sent via email to participants regarding staffing, workload, and care left undone on two patient safety outcomes identified in the study (p. 135). Permission was obtained by Rutgers University's Institutional Review Board before data collection occurred (p. 134). Variables measured in the study include patient safety outcomes, registered nurse staffing, workload, and nursing care left undone (p. 135-136). Data analysis included frequency distributions and descriptive statistics for each study variable. Two linear regression models were used to determine the individual/independent effects

of patients to registered nurse ratios, workload, and care left undone for both patient safety

outcomes. Four least square regression analyses were used to estimate indirect effects of patient

to registered nurse ratios, and workload on safety at patient shift change, and patient safety grade

outcomes. Bootstrap samples were used to determine indirect effects that were statistically

significant (p. 137). The results show that "high patient-to-RN ratios, high RN workloads, and

inadequate care processes were directly or indirectly associated with safety outcomes in

hemodialysis facilities" (p. 137). The researchers concluded that high patient to registered nurse

staffing, workload, and care left undone contribute to unsafe patient shift change periods and

lower safety ratings in hemodialysis facilities. These outcomes can be improved by ensuring

adequate staffing and reasonable workloads and redesigning responsibilities so nurses can

complete the most important care activities (p. 141). The current study asks about care left

undone, so some parallels may be evident across studies. This study has limitations. The study

was limited to one type of facility in two states, so the findings may not be applicable to other

populations. The study had a low response rate. Some participants added that their employers

would not allow them to complete the survey. Reluctance to respond to the survey for various

reasons makes data collection for researchers difficult. The study had no control group, which

provides no base work environment to compare to (p. 141).

   The hospital setting produces work environments that stress nurses, possibly leading to

patient care errors. The purpose of the next study for this area of research is to assess nursing

workload as a predictor of mortality using the Nurses Activities Score scale (Fasoi et al., 2020).

The participants of the study included 82 nurses working in 3 adult intensive care units in 2

public hospitals in Athens. There were 293 patients in the intensive care units during the study

period (p. 2). The study was cross-sectional and involved no intervention. Data was collected

from observation, collection of information from nurses, and the nurses' care reports (p. 2). The

Nurses Activities Score scale was used to collect data from the previously stated sources. It

includes 23 items that measure tasks of nurses in intensive care units. Recordings are about 24

hours of data collection and must be done at the same time of the day for each patient. Non-

nursing activities do not count (p. 2-3). Variables include a wide variety of tasks found on the

Nursing Activities Score Items and Weights table listed in the study (pp. 3-4). Data analysis was

done using the SPSS 25. (IBM, Athens, Greece). ANOVA analysis was used, as well as Pearson

Correlation and Cronbach's Alpha, among other statistical tests (p. 5). Results are extensive for

this study; however, the researchers conclude that nurse workload in intensive care units seemed

to be higher for patients that died compared to patients that survived, and this may indicate a

correlation between the two variables (p. 11). Because a higher workload may be correlated with

increased patient mortality, this is concerning considering the hypothesized increased fatigue

from nursing workload that the current researcher has considered. This study has limitations. The

small sample size limits the ability to generalize the results to intensive care units in general.

Items from the Nursing Activities Score scale may have been omitted due to increased nurse

workload. There was an absence of an organized method for measuring missed care/errors in

medication administrations, which may be associated with nurse workload and patient mortality.

Because the study is descriptive, cross-sectional, and non-analytical, results must be used with

great caution (p. 10-11).

   In Finland, a system named RAFAELA was designed to ensure appropriate resource use

and optimal nursing workload. The third study in this research area aims to investigate whether

daily workload per nurse, measured on the RAFAELA system, correlates with patient safety and

mortality incidents (Fagerstrom, 2018). Data was collected from 36 units at 4 Finnish Hospitals.

One hospital is a tertiary acute care hospital, and the other three are secondary acute care hospitals. Various specialties were included in the study (p. 2). Data collected includes daily measurements based on the RAFAELA system, corresponding to every admitted patient. Two hundred and forty-nine classifications of patient nursing intensity were collected. All data was collected over a period of 1 year (pp. 2-3). There was no intervention, as the researchers pulled data from the RAFAELA system. An explanation of the RAFAELA system's data collection is explained in the study. (pp. 2-3). Nursing workload and various types of incidents were examined (p. 4-5). Data analysis includes statistical regression analyses, data coding, logistic regression models, parallel analyses, the SPSS version 21, and decision-analytic methods (p. 3). Results show that patient mortality was higher if the nurse was higher than the recommended optimal level for workload. Nursing workload at or less than the optimal level was associated with 8%-34% higher odds of an incident, and 43% higher odds of patient mortality, compared with optimal levels of nursing workload (p. 3). The researchers conclude that nursing managers must use staff optimally because there are limited nursing resources. The traditional nurse-to-patient ratio is not necessarily preferable when accounting for patient acuity. Allocation of resources is crucial for positive patient outcomes. Future research regarding whether patients' outcomes are better when daily workload is monitored should be done (p. 10). The current study has taken place at a time when there are limited nursing resources, so responses should reflect this. This study has limitations. Incident reports can be unreliable. Other factors on the ward may not have been accounted for. Skill mix, competence level, and work experience were not accounted for. Age, sex, and diagnosis were not taken into account. A death occurring on a ward may not be replicated on other days, so further analysis is needed (p. 9).

The three studies that outline environments resulting in patient care error show how the environment the nurse works in can drastically alter patient outcomes in the form of medical errors. Patient safety in hemodialysis patients, patient harm and mortality in intensive care units, and prediction of mortality based on the RAFAELA system in Finland all show how critical a safe working environment is for a nurse. Recommendations for reduction in workload and better allocation of resources are more easily said than done, especially with the current nursing shortage. The current study has similar limitations, including lack of generalizability, small sample size, and patient diagnosis/acuity.

Summary

To ensure patient safety, it is imperative that the research areas outlined be addressed in nursing practice. The current nursing shortage and Covid 19 pandemic exacerbate the issues outlined, reducing patient safety. It is important to note that all of these areas of research interrelate with fatigue, which is a main cause of patient care errors. The studies showing how fatigue is linked to patient care errors, including cognitive medical errors, vital sign observations, and care left undone, provide significance for the other two areas of research. The studies showing how consecutive hours worked lead to more fatigue is the most important portion of this literary review because it is the backbone idea of the current study to investigate. Systematic review of hours worked, examination of hours worked by nurse anesthetists and examination of consequences of working consecutive long shifts all point to an accumulation of fatigue. The studies showing how nursing environments result in patient care errors show how the physical workplace may be at fault for patient care errors occurring. Reduced patient safety in hemodialysis patients, adverse outcomes in intensive care units, and prediction of mortality in Finland all show how the work environment can be a catalyst for patient care error. Various

recommendations by researchers either lack data or are insufficient solutions to a complex problem. A nurse can be told to reduce his/her stress level outside of work, and nurse managers can be told to use caution, but stating the obvious provides little direction for these populations to take. Limitation of the reviewed literature and the current study have been identified. The strengths of the current study include observation of the participant during completion of the questionnaire, identification of other aspects of the problem in the open response interview section, and exclusivity to only nurses completing the study. The current study contributes to the literature by providing a qualitative perspective on consecutive hours worked and how the fatigue accumulated leads to patient care errors. It offers a chance for nurses to show their perspectives in various methods by responding to Likert scale questions and open-ended interview questions.

Chapter Three: Methods

Across the globe, nursing consistently has various issues that result in patient care errors. This includes fatigue and factors that increase fatigue, such as the environment and consecutive hours worked. The number of hours worked consecutively is the primary focus of this research design. Literature, as well as anecdotal evidence observed by the researcher, points to this area being a main contributor to fatigue and subsequent patient care errors. The current Covid-19 pandemic, along with the current nursing shortage, has led to the trend of increased hours worked by nurses in many settings. This increase in hours worked is concerning because the literature has consistently shown adverse effects of working so many hours. Patient care errors are widely preventable, yet errors that cause harm or even lead to death occur on a daily basis.

To narrow the focus and provide a measurable determinant of fatigue, the researcher aims to answer the following: are nurses who are limited to 8-hour shifts at decreased risk for making

patient care errors, compared with nurses who do not limit their hours and work 12-16 hour

shifts throughout the workday? This focus allows the researcher to analyze collected data and

answer the specific question most relevant to this area of concern. In researching the hours and

subsequent fatigue that is accumulated, a possible correlation can be drawn between the two

criteria. The narrow scope also allows for an organized grouping of data trends.

A qualitative research design was used for this study. Descriptive data was collected via

an anonymous survey utilizing the convenience of the internet. Likert scale questions, questions

allowing short, open-ended responses, and various demographic data was collected. Questions

were asked in a manner that allows the data to reflect the participants' perceptions about fatigue,

consecutive hours worked, and likeliness to make a patient care error. The primary goal of the

data collection was to identify a correlation between consecutive hours worked and subsequent

fatigue. Data was collected and analyzed using various graphs made on google docs.

Setting

This study took place anonymously online via purposive sampling. The identities of the

sample cannot be determined due to the nature of an anonymous survey. Utilizing the internet

provides the mechanism to connect with individuals that are scattered across the United States,

therefore allowing nurses to be able to participate in this manner. Various forms of social media,

including Facebook were sites used for linking the survey. Further distribution of the study is

possible; however, an individual would need to copy and send the link to whomever they choose.

The study was posted in areas where a large volume of nurses would have an online presence.

Participants

The sampling method used by the researcher was purposive sampling. All participants

met the following criteria to be in the sample: participants must be a nurse above the age of 18

and have an understanding of the typical workflow at an area of nursing where patients receive

care. Participants were solicited in convenient ways that allowed the possibility for an acceptable

number of responses. Participants included at least 10 nurses of various education levels, ages,

and work experience. The participants anonymously completed the survey to ensure that

everyone in the sample was deidentified. The participants' locations, including workplace, state,

and the town could not be identified with the study. The participants all claimed to hold a nursing

degree and have worked as a nurse taking care of patients in some nursing setting. The survey

could not be submitted without declaring degree status. Demographic data is shown in detail in

chapter four.

Measurement Instruments

The researcher used a survey constructed by the researcher for the study. The purpose of

the questionnaire was to evaluate qualitative data regarding various questions that measure level

of fatigue; consecutive hours worked; likeliness to make a patient care error; as well as

demographic data. The questionnaire contains 10 Likert-scale questions, two open-ended

questions allowing for short answers, and demographic multiple-choice questions. The survey

was made on google docs and was administered via a link provided by the researcher to access

the survey. The survey link was posted on various social media platforms on the internet and

could be completed any time after the questionnaire was posted. The Likert scale questions and

demographic data were visualized on graphs using excel, and the open-ended questions were

grouped by trend.

The questionnaire was approved by the Institutional Review Board at Anna Maria

College after collaboration between the researcher's faculty sponsor and faculty advisor. A pilot

questionnaire was sent to various individuals in order to: assess the clarity of what was being

asked; whether the measurements were relative to the research question; and if the questions were appropriate in the context of nursing. The questionnaire was described by these individuals as relevant, easy to understand, and appropriate to the topic of nursing.

Procedure

The data were collected through reviewing the questionnaire responses. The responses were solicited from various social media platforms on the internet, with a high probability that nurses will view the solicitation. The researcher posted the study online. The data collection process took place over several weeks upon receiving approval from the Institutional Review Board at Anna Maria College. The questionnaire was open to completion at any time during the data collection period.

Data Analysis

The data was organized into three different parts. The first part shows the demographic data of the participants, including level of work experience, age, and level of education. The second part shows trending results from the interview questions, organized via data coding. The third area shows significant responses to Likert scale questions. Visual graphs are included to aid in understanding the data.

Chapter Four: Results

The data included in this section has been compiled originally from the responses on the survey used for this study. Purposive sampling was the best option for this type of survey. Due to the nature of an anonymous online survey, only those who see the survey by chance would be able to respond to it. Utilizing the internet allows connection with many individuals across the United States. The questionnaire used was submitted anonymously online via a link posted to

Facebook, Facebook Messenger, and other places that participants voluntarily shared the link. Facebook was targeted because of the large volume of nurses that are present.

The participants included nurses 18 years and older who have an understanding of the typical workflow at a facility where patients receive care. Participants included 127 nurses of various education levels, ages, and work experience. Participants cannot be identified due to the anonymous nature of the survey. All participants claimed to hold a nursing degree and work experience in nursing. The participants could not submit the survey if criteria for submission were not entered. The data was collected through analyzing the survey responses. The survey was open to responses for one week after it was posted. The survey could be completed at any time during this period.

The data analysis was organized into three sections derived from the survey instrument used. Demographic data, coded data showing trends from two interview questions, and Likert scale responses that show significance are included in this results section. The coded data contains broad sections that subdivide into trends and demographic data specific to those trends. The Likert scale questions are accompanied by a pie chart representative of the responses. Data is also expressed by integers and percentage. Trends from the interview questions are accompanied by quotations transcribed from participant responses.

Demographic Data

Demographic data represented in a pie chart recorded: years of work experience in nursing; age; and education level. Other identifiers were purposely omitted from this section of the survey to protect anonymity.

Years of work experience in nursing

Of 127 participants, 31 (24.4%) have 0-2 years of experience, 49 (38.6%) have 3-10

years of work experience, 21 (16.5%) have 11-15 years of work experience, 9 (7.1%) have 16-20

years of work experience, and 17 (13.4%) have 21+ years of work experience.
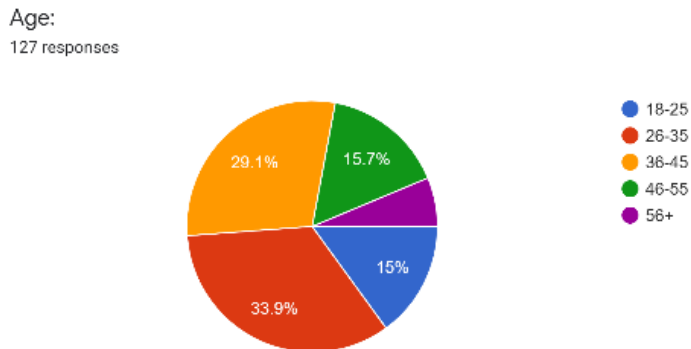
Figure 1

Years of work experience in nursing:
127 responses

- 0-2
- 3-10
- 11-15
- 16-20
- 21+

16.5% 13.4% 38.6% 24.4%
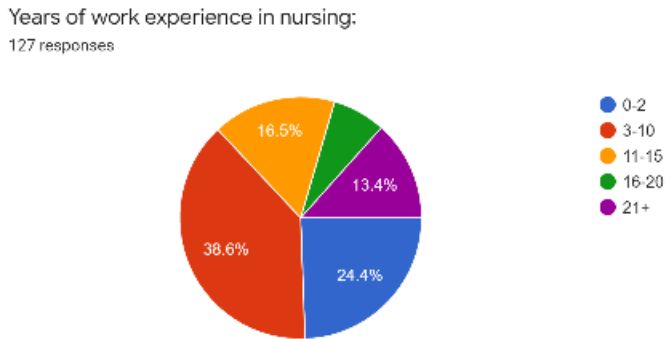
Graph showing years of work experience.

Age

Of 127 participants, 19 (15%) are ages 15-25, 43 (33.9%) are ages 26-35, 37 (29.1%) are

ages 36-45, 20 (15.7%) are ages 46-55, and 8 (6.3%) are ages 56 or older.
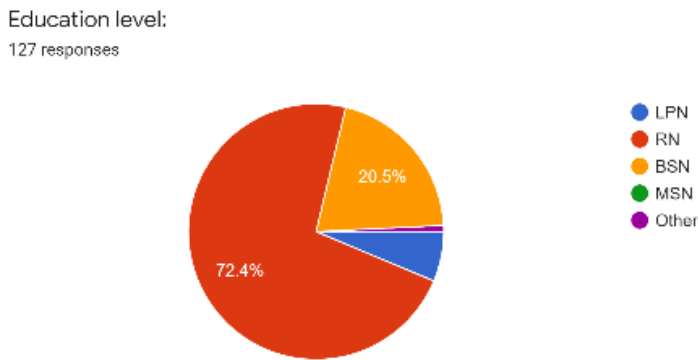
Figure 2

Age:
127 responses

- 18-25
- 26-35
- 36-45
- 46-55
- 56+

29.1% 15.7% 15% 33.9%

Graph showing participants' ages.

Education level

Of 127 participants, 8 (6.3%) are LPNs, 92 (72.4%) are RNs, 26 (20.5%) are BSNs, 0 (0%) are MSNs, and 1 (0.8%) identifies as "other."

Figure 3

Education level:
127 responses

Graph showing participants' education levels.

Data Coding for Interview Question 1

Interview question 1 asked the participants: Have you ever been mandated to work a 12- or 16-hour shift when originally scheduled 8 hours, and did that affect the care you provided in any way? The results indicated that out of 127 participants, 65 (51.2%) have not been mandated and 62 (48.8%) have been mandated. Of those mandated, several trends emerged.

Negatively Affected care as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 42 (67.7%) participants expressed that patient care was negatively affected on their assigned shifts. Of these participants, 5 (11.9%) are LPNs, 29 (69.0%) are RNs, 7 (16.7%) are BSNs, 0 (0%) are MSNs, and 1 (2.4%) identified

as other. An example of a response that expressed this follows: "Yes I have been mandated to work more hours after working a 12-hour shift. Yes, the care I provided was less than the care I was able to provide for the previous 12 hours."

Fatigue as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 9 (14.5%) participants expressed that their fatigue increased on their assigned shifts. Of these participants, 1 (11.1%) are LPNs, 8 (88.9%) are RNs, 0 (0%) are BSNs, LPNs, or "Other." An example of a response that expressed this is as follows: "I have been mandated to work 16 hours when originally scheduled for 12. I also had to work again the next day, which was brutal. I could hardly keep my eyes open on my way home."

Forgetfulness/Decreased Concentration as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 4 (6.6%) participants expressed that they became more forgetful/less concentrated on their tasks on their assigned shifts. Of these participants, 1 (25%) is an LPN, 1 (25%) is an RN, 2 (50%) are BSNs, and 0 (0%) are MSNs or identified as "other." An example of a response that expressed this follows: "I normally work 12 hours but have been mandated for 16, it definitely affects care as I am more fatigued I am more likely to make mistakes or forget tasks."

Practicing Slower as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 5 (8.1%) participants expressed that their work speed became slower on their assigned shifts. Of these participants, 1 (20%) is an LPN, 4 (80%) are RNs, and 0 (0%) are BSNs, MSNs, or identified as "other." "An example of a response that expressed this follows: "Yes. I do not believe it affected my patient care, but I do feel I was slower in my practice."

Negatively Affected Emotional Status as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 7 (11.3%) of participants expressed that their emotional status was negatively affected while working their assigned shifts. Of these participants, 0 (0%) are LPNs, 7 (100%) are RNS, and 0 (0%) are BSNs, MSNs, or identify as "other." An example of a response that expressed this follows: "It's not just fatigue. It's the ability to be compassionate that also declines. Nurses get irritable and lose their bedside manner. The patient loses in all scenarios."

Concern for Patient Safety as a Result of Working 16 Hours

Of those who have been mandated to work 16 hours, 2 (4.7%) participants expressed that they are concerned about patient safety while working their shifts. One individual that has never been mandated to work 16 hours stated that working 16 hours puts the patient's safety at risk. Of the participants that have been mandated, 2 (100%) are RNs, and 0 (0%) are LPNs, BSNs, MSNs, or identity as "other." An example of a response that expressed this follows: "Yes. I worked a 12-hour shift and was mandated to work another 6 hours after that. I started at 6 pm and got off of work at noon the next day. I felt like an absolute zombie! So tired at the end of my shift, and I was so irritable towards everybody-decreasing my patient care. My brain felt like it wouldn't work after a certain point in the shift, and I went into an "autopilot" mode. Thankfully no medication errors were made."

Data Coding for Interview Question 2

Interview question 2 asked the participants: Do you "cut corners" when you know you must work past a regular shift to reduce your level of fatigue? Explain. The results show that out of 127 participants, 96 (75.6%) do not cut corners, and 31 (24.4%) do cut corners. Again, trends emerged from the participants that have admitted to cutting corners.

Practiced Slower as a Method of Cutting Corners

Of those that admitted to cutting corners, 5 (16.1%) participants expressed that they slowed down their work speed in anticipation of working past a regular 8-hour shift. Of these participants, 5 (100%) are RNs, and 0 (0%) are LPNs, BSNs, MSNs or identify as "other." An example of a response that expressed this follows: "No, I find it takes me longer to do the work as I slow down as I get tired. Others get less quality time. Nurses, patients, and the organization suffers."

Reduced Patient Interaction as a Method of Cutting Corners

Of those that admitted to cutting corners, 4 (12.9%) participants expressed that they reduced patient interaction in anticipation of working past a regular 8-hour shift. Of these participants, 3 (75%) are RNs, 1 (25%) is a BSN, and 0 (0%) are LPNs, MSNs, or identify as "other." An example of a response that expressed this follows: "Yes. I will not put as much effort in interacting with my patients. I am more task-oriented and just try to get my work done."

Omitting Care as a Method of Cutting Corners

Of those that admitted to cutting corners, 4 (12.9%) participants expressed that care was omitted from their practice in anticipation of working past a regular 8-hour shift. Of these participants, 2 are RNs (50%), 2 are BSNs (50%), and 0 (0%) are LPNs, MSNs, or identify as "other." An example of a response that expressed this follows: "Yes. Bare minimum only."

Clustering/Grouping Care as a Method of Cutting Corners

Of those that admitted to cutting corners, 3 (9.7%) participants expressed that they clustered/grouped care in anticipation of working past a regular 8-hour shift. Of these participants, 2 (66.7%) are LPNs, 1 (33.3%) is an RN, and 0 (0%) are BSNs, MSNs, or identify

as "other." An example of a response that expressed this follows: "I do whatever I can to maintain my level of care, but I might cluster things more in fewer visits."

Pre-Preparing Medications as a Method of Cutting Corners

Of those that admitted to cutting corners, 3 (9.7%) participants expressed that they pre-prepared medications in anticipation of working past a regular 8-hour shift. Of these participants, 2 (66.7%) are LPNs, 1 (33.3%) is a BSN, and 0 (0%) are RNs, MSNs, or identify as "other." An example of a response that expressed this follows: "Yes, I pre pop medications so the patients receive their medications before going to bed and have to be woken up."

### *Changed Documentation Behavior as a Method of Cutting Corners*

Of those that admitted to cutting corners, 3 (9.7%) participants expressed that they changed their behavior regarding documentation in anticipation of working past a regular 8-hour shift. Of these participants, 1 (33.3%) is an RN, 2 (66.7%) are BSNs, and 0 (0%) are LPNs, MSNs, or identify as "other." An example of a response that expressed this follows: "Yes, limited charting."

Significant Likert Scale Responses

Several groups of data from the Likert scale responses stand out and are relevant to the research question. Likert scale questions 1 and 2 compare the ability to make accurate, clear decisions after working 12 hours, and 16 hours. After working 12 hours, 38.6% of participants either disagree or strongly disagree that they are able to make accurate, clear decisions. After working 16 hours, 82.7% of participants either disagree or strongly disagree that they are able to make accurate, clear decisions.
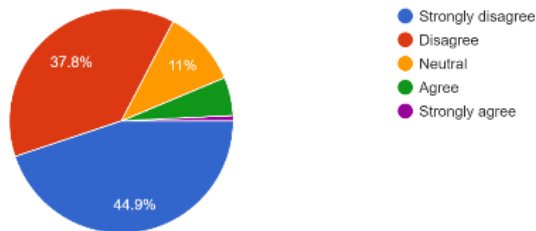
Figure 4

After working 12 hours, I am able to make accurate clear decisions.
127 responses
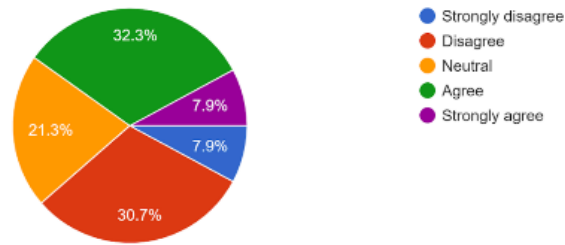
"Disagree" and "Strongly disagree" are substantially less common responses compared to figure

5.

Figure 5

After working 16 hours, I am able to make accurate clear decisions.
127 responses

"Disagree" and "Strongly Disagree" are substantially more common responses compared to

figure 4.

　　　Likert scale question 3 asks participants if they can provide the best care they can, even

when mandated to work 16 hours. The graph shows that 89.8% of participants either disagree or

strongly disagree with the statement.

Figure 6

I can provide the best care I can even when mandated to work 16 hours
127 responses
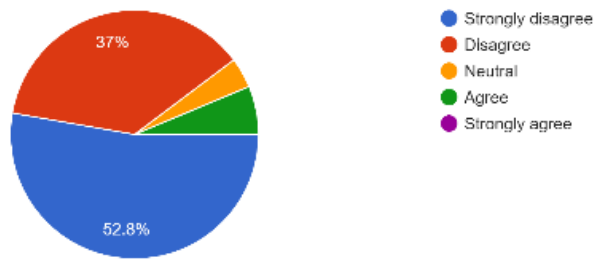
"Disagree" and "Strongly disagree" appear very frequently.

Likert Scale question 4 asks participants if they feel a greater level of fatigue after working more than 8 hours, compared to working 8 hours or less. The graph shows that 54.3% of participants either agree or strongly agree with this statement.

Figure 7

I feel a greater level of fatigue after working more than 8 hours, compared to working 8 hours or less.
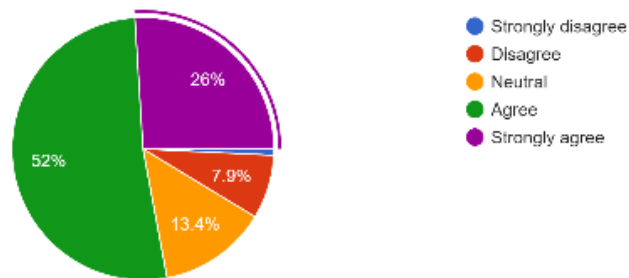127 responses
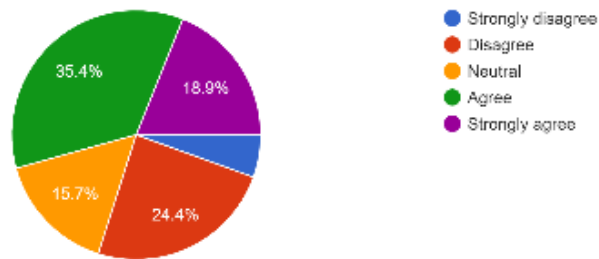
"Agree" and "Strongly agree" appear very frequently.

Likert scale question 6 asks participants if they feel safe unsafe in their practice when fatigued. The graph shows that 78% of participants either agree or strongly agree with this statement.

Figure 8

I feel unsafe in my practice when fatigued.
127 responses

"Agree" and "Strongly agree" appear very frequently.

Chapter Five: Discussion

Globally, the issue of fatigue in nursing has been gaining attention as a result of the potential to make patient care errors. The contemporary state of healthcare combined with the Covid-19 pandemic has led to more nurses working longer shifts. From global, all the way down to a local level, the number of patient care errors that occur in health care is unnerving. Other factors such as workload and work environment all interplay with the accumulation of fatigue, possibly exacerbating the occurrence of patient care errors. Further exploration in these areas of research is necessary.

It is suggested by various researchers that working longer hours leads to accumulation of fatigue and a higher likelihood for making patient care errors. The occurrence of fatigue also has an anecdotal sentiment among those who work many hours. It becomes quite obvious and possible to hypothesize its contribution to the occurrence of patient care errors. The purpose of this study was to identify whether or not there is a perceived increase of fatigue from working more than 8 hours. Again, it is important to state the research question: are nurses who are limited to 8-hour shifts at decreased risk for making patient care errors, compared with nurses who do not limit their hours and work 12-16 hours throughout the workday?

The study was a qualitative survey with 10 Likert scale questions, and two interview questions regarding fatigue from working more than 8 hours. In addition, demographic data of the participants was also collected. The survey was distributed on social media where a high percentage of nurses could be recruited. The data was analyzed, and trends became apparent from the Likert scale data and interview questions. The data presented shows the most important and relevant findings from the survey.

Discussion

The demographic data reveals that the mode level of work experience is 3-10 years (38.6%), followed by 0-2 years (24.4%), 11-15 years (16.5%), 21+ years (13.4%), then 16-20 years (7.1%). The mode ages of the participants are ages 26-35 (33.9%), followed by ages 36-45 (29.1%), ages 46-55 (15.7%), ages 18-25 (15%), and ages 56 or older (6.3%). The mode education level of participants is RN (72.4%), followed by BSN (20.5%), LPN (6.3%), other (0.8%), and MSN (0%). The distribution of the demographics could be related to the demographics of the social media platforms that the survey was posted on. It is difficult to ascertain other reasons for the distribution, as this was not a focus of the data collection, and participants remained anonymous.

The data from interview question 1 indicated 62 (48.8%) participants have been mandated to work 12-16 hours shift when originally scheduled 8 hours. Trends that emerged with data coding include: negatively affected care, increased fatigue; forgetfulness/decreased concentration; slower practice; negatively affected emotion; and concern for patient safety. The high number and percentage of participants who have been mandated to work longer than they originally agreed to work is concerning. All these trends have an influence on how a nurse performs, and the potential for making a patient care error is very apparent. It is important to

note, however, that being mandated to work longer than 8 hours may have a different affect than a voluntary shift longer than 8 hours.

The data from interview question 2 revealed 31 (24.4%) of participants "cut corners" when aware they will work past an 8-hour shift. Trends that emerge with data coding include: slower practice; reducing patient interaction; omitting care; clustering/grouping care; pre-preparing medication; and changing documentation behavior. More than three-fourths of all participants do not cut corners if they anticipate working a long shift, which is reassuring information. However, of those that do cut corners, the risk to patient care is obvious. The question does not assess whether participants cut corners for other reasons.

Likert scale questions 1 and 2 show a large increase of "disagree" and "strongly disagree" responses. Question 1 stated "After working 12 hours, I am able to make accurate clear decisions." After working 12 hours, 38.6% of participants either disagree or strongly disagree with this statement. Question 2 stated "After working 16 hours, I am able to make accurate clear decisions. After working 16 hours, 82.7% of participants either disagree or strongly disagree with this statement. The dramatic increase in participants perceiving an inability to make accurate clear decisions is concerning. Nurses are working longer hours, and if they cannot make accurate clear decisions, then the risk to patient care increases. This question assesses the perception of inability, however, and participants may or may not be able to make accurate clear decisions.

Likert scale question 3 stated "I can provide the best care I can even when mandated to work 16 hours. Of the participants, 89.8% either disagree or strongly disagree with this statement. The number of disagreeing participants is alarming. This suggests that the quality of patient care potentially decreases if participants are mandated to work 16 hours. Again, this

question assesses perception, so it does not assess whether participants can actually provide their

best level of care.

Likert scale question 4 stated "I feel a greater level of fatigue after working more than 8

hours, compared to working 8 hours or less." Of the participants, 54.3% either agree or strongly

agree with this statement. The perceived higher level of fatigue is significant. Fatigue is

subjective to the participant, so although objective measures of fatigue are not assessed, the

responses have merit to the client's accumulation of fatigue. This question is of particular value

in answering the research question.

Likert scale question 6 stated "I feel unsafe in my practice when fatigued." Of the

participants, 78% either agree or strongly agree with this statement. The perceived concern for

safety is staggering. Safety is a top priority for nurses, and part of the skillset of the nurse is to

assess safety of the situation. If nurses are assessing and determining the situation to be unsafe,

this is an important consideration to the safety of their patients.

Limitations

There are several limitations that negatively impact the internal validity of this study. The

survey was conducted anonymously, and responses could not be verified. This included:

demographic information; interview question responses; and Likert scale responses. Many

variables could not be identified and accounted for, because the places of employment of the

participants are unknown. Purposive sampling led to recruitment of participants from only the

social media platforms used, which may affect the population of nurses that were recruited.

Survey questions may not have adequately assessed all research areas of the issue at hand, so

important or relevant information may not have been included. The survey assessed the

perceptions of the participants and did not assess whether the described phenomenon actually

occurred. The results may not be applicable to what manifests in the real world. Some survey

questions may have been interpreted differently between participants, which could have skewed

the results.

There are also several limitations that negatively impact the external validity of this

study. The participants likely worked in a variety of settings, locations, and facilities, with a

variety of patients, patient acuities, and patient care objectives. This means the results cannot be

applicable to any specific area of patient care, as well as the general population of nurses. The

demographics of the participants was widely distributed, so the results cannot be applicable to

any specific group of nurses. The results can be used for descriptive and explorative purposes

only.

Recommendations for future research

In order to accurately assess fatigue that accumulates while working consecutive hours,

an experimental study that controls as many variables as possible must be performed. This study

must include a specific demographic of nurses, at a specific type of facility or facilities. The

participants must have a similar workload, be performing a similar type of work, and take care of

patients with similar acuity. The participants' responses must be verified. An objective

measurement of fatigue should be required, and a control group must be utilized in order to

compare the results.

Other areas of study include those that are limitations of other studies that have been

observed. For example, a study about missed vital signs after working 12 or more hours would

need to have a control group and identify what counts as "missed" and what does not. Studies in

which participants may change their answers for personal reasons may be augmented to account

for this. Studies that were limited to certain locations could be expanded to improve external

validity.

Conclusion

Three conclusions can be identified from this study. The first conclusion is that as nurses

work more hours consecutively, their perception of being fatigued increased. The second

conclusion is that working more than a regular shift may perpetuate behavior that increased the

risk of making a patient care error. The third conclusion is that despite working long hours, many

nurses still attempted to uphold a standard level of care.

Most notable in Likert scale questions 1 and 2 is the increase in nurses disagreeing with

the statement that they can make accurate clear decisions after working 12 and 16-hour shifts.

Likert scale question 4 identified that more than half of the participants perceived more fatigue

when working more than 8 hours, compared to working 8 hours. The trend of nurses becoming

more fatigued with more consecutive hours worked is very apparent. This may not be applicable

to all nurses, however, because a large portion of responses did not agree with the majority.

Likert scale question 3 revealed that most nurses perceived that they cannot provide the

best care they can when mandated to work 16 hours. Likert scale question 6 identified that most

nurses feel unsafe in their practice when fatigued. Trends from both interview questions 1 and 2

showed that nurses may change their behavior depending on the number of hours they work, and

the behaviors they change could potentially increase the risk of making a patient care error.

Again, this does not apply to every response, as there are a substantial number of participants

that express the opposite opinions.

Throughout many Likert scale question responses and interview responses, there is data to

suggest that although nurses may work long hours, they disagree with the previously presented

data, and may uphold their work standards. There were several responses similar to "No it didn't affect the care I rendered" when asked if working 16 hours affected care, and there were several "No" responses when asked if participants cut corners in anticipation of working a long shift. These responses could not be verified, however, and participants may or may not have been truthful with these questions. Perhaps these questions are uncomfortable to answer, and participants chose to omit mentioning care that was not up to meeting the expected standards of care.

Employers should use great caution when scheduling nurses to work longer than 8 hours consecutively, especially when it is necessary to mandate a nurse to work past their shift. The potential to make a patient care error that results from fatigue is a very real concern. While the data in the study does not prove that nurses become more fatigued after working longer hours, and that patient care errors resulted from this, the study did prove that the perception of these risks are widely present in the nursing profession. An ideal limit on the number of hours a nurse should work alludes researchers, and nurses should work with their employers to determine what is safe for them to work within the scope of what is legal. To answer the research question, nurses who are limited to 8 consecutive hour shifts may be at decreased risk for making patient care errors, compared with nurses who do not limit their hours and work 12-16 hours throughout the workday.

The process of getting approval from the Institutional Review Board at Anna Maria College, and conducting the study was a unique experience for this researcher. Initially, the study was supposed to be conducted at a nursing facility; however, permission could not be obtained. The process of adapting to this hurdle and augmenting the study was difficult, however the experience is valuable. This study was driven by anecdotal experience of this researcher working

in a nursing facility. To see a widely discussed phenomenon in nursing expressed in the form of a

study is exciting to say the least.

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Appendix A: Survey

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For each of the questions below, circle the response that best describes how you feel about the statement.

1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, and 5 = Strongly Agree.

Statement	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
After working 12 hours, I am able to make accurate clear decisions.	1	2	3	4	5
After working 16 hours, I am able to make accurate clear decisions.	1	2	3	4	5
I can provide the best care I can even when mandated to work 16 hours.	1	2	3	4	5
I feel a greater level of fatigue after working more than 8 hours, compared to working 8 hours or less.	1	2	3	4	5
My ability to concentrate decreases after working 8 hours consecutively.	1	2	3	4	5
I feel unsafe in my practice when fatigued.	1	2	3	4	5
I perceive a higher likelihood of making an error in patient care when working more than 8 hours.	1	2	3	4	5
I feel more likely to omit patient care unknowingly when I work more than 8 hours.	1	2	3	4	5
My ability to remember tasks decreases after working 8 hours.	1	2	3	4	5

The speed at which I can safely work decreases after working 8 hours.	1	2	3	4	5

Interview Questions:

1. Have you ever been mandated to work a 12- or 16-hour shift when originally scheduled 8 hours, and did that effect the care you provided in any way?

2. Do you "cut corners" when you know you must work past a regular shift to reduce your level of fatigue? Explain.

Please answer the following:

Years of work experience in long term care:

0-2	3-10	11-15	16-20	21+

Age:

18-25	26-35	36-45	46-55	56+

Education:

LPN	RN	BSN	MSN