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Comparison of the Effects of Telehealth versus N95 on Nurse-Patient Communication

Tony Christopher Bloomfield
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Walden University

College of Nursing

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Tony Bloomfield

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Walden University

2023

Abstract

Comparison of the Effects of Telehealth versus N95 on Nurse-Patient Communication

by

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MSN, California State University, Dominguez Hills, 2012

BSN, California State University, Dominguez Hills, 2008

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Nursing Education

Walden University

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Abstract

Telehealth and face masks are some of the infection control measures nurses use while attending to patients. Nurses provide the most patient care in hospital settings and thus spend the most time with patients in their recovery journey. Because communication is paramount to the role nurses play as health care professionals, there is a substantial need to investigate how infection control measures affect the quality of nurse-patient communication. The purpose of this quantitative cross-sectional study was to describe the relationship of methods aimed at maintaining social distancing between nurses and patients to nurse-patient communication and to compare differences in the quality of communication when using such methods within the hospital setting. This study was grounded in the change theory and the mathematical theory of communication. These theories informed the study's variables and research questions. The Nurse Quality of Communication with Patient Questionnaire was administered online to help collect the primary data used in the study. The data were analyzed using point bi-serial correlation coefficients and independent samples t tests ($n=244$). The results revealed a significant association between the two social distancing methods and the perceived quality of communication between nurses and patients ($r_{pb} = .656, p < .001$; $r_{pb} = -.656, p < .001$). The results also revealed a significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients: $t(242) = -14.57, p < .001$. The findings of this study will facilitate improved safety in the clinical setting and help steer cooperation between nurses and patients.

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Dedication

This dissertation and doctoral study are dedicated to my spouse, Leon Frink, and in memory of my parents, Mr. Ollie Bloomfield and Mrs. Mary Elizabeth Smith-Bloomfield. My parents were kind and caring and always supported their children. My dissertation journey was successful due to the encouraging words and the positive support of my family, friends, and colleagues. I have learned much from my experience and have much to learn moving forward.

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Chapter 1: Introduction to the Study

Introduction

COVID-19 is an infectious respiratory disease that spreads rapidly and can lead to severe illness, hospitalization, and death (World Health Organization, 2021). COVID-19 became a global pandemic as of January 30, 2020. As of January 4, 2022, there were 290,959,019 confirmed COVID-19 cases, of which 5,446,753 people had succumbed to the disease (WHO, 2022). To prevent COVID-19 from spreading, social distancing requires personal protective equipment (e.g., face masks) and the maximization of individual hygiene levels (WHO, 2021). However, instituting such measures in a hospital system is complex because of the necessity for interaction between patients and nurses providing care.

The fast-growing COVID-19 surge witnessed in 2020 forced hospital and ICU leaders to swiftly modify operations to fit the new norm (Lipworth et al., 2021). Face masks and telemedicine were the infection control measures that health facilities adopted. In hospitals, health workers were directed to implement source control measures including the routine use of NIOSH-approved N95 masks or the equivalent (Centers for Disease Control and Prevention, 2022). The COVID-19 pandemic also catalyzed the rapid adoption of telehealth to deliver health care from a distance (Wosik et al., 2020). Although both measures aim to achieve infection control, they work differently. Telehealth involves using digital information and communication technologies to access health care remotely (Coleman, 2020). Telehealth maintains social distancing between the patient and the nurse. This method minimizes physical contact between patients and

health workers during the COVID-19 outbreak because they can monitor a patient's health progress from the hospital while the patient is at home. Minimizing physical interaction reduces the risk of transmitting the infection between health workers and patients. Face masks allow in-person interaction using a barrier to prevent inhalation of viral particles. Health workers must use transparent physical barriers and polycarbonate plastics with better impact resistance than glass. In addition, gloves and other preventive clothing are used when making contact with the patient (Centers for Disease Control and Prevention, 2022; Islam et al., 2020). Despite the effectiveness of such measures in maintaining infection control, their effects on other important aspects of patient care are unclear.

Communication is paramount to nurses' role as the health care professionals who provide the most patient care and education in hospital settings. Clear communication is vital in facilitating the proper treatment of patients (Tiwary et al., 2019). Poor communication between healthcare professionals and patients can bring about misunderstanding and misdiagnosis, which can, in turn, cause life-threatening complications for patients (Tiwary et al., 2019).

COVID-19 has drastically affected how people communicate within healthcare environments (Mheidly et al., 2020). Given that many emerging infectious diseases could result in another worldwide pandemic in the not-too-distant future (Bloom et al., 2017), the changes in how we communicate with patients that we are experiencing now may become the new normal. High-quality communication between patients and nurses is necessary to achieve positive patient outcomes and maintain patient safety. Therefore,

there was an urgent need to understand better how different methods used to support infection control in the hospital setting might affect the quality of nurse-patient communication. In this study, I compared the quality of communication when using N95 face masks versus telehealth devices. The findings of this study will impact potential positive social change by showing which measure could be more effective in ensuring quality communication between nurses and patients.

The findings will also contribute to the understanding of the strengths and weaknesses of each infection control methods regarding the quality of communication. The remainder of this chapter includes an overview of the study, including the background, the problem statement, the purpose of the study, research questions and hypotheses, theoretical framework, nature of the study, definition of terms, assumptions, scope and delimitations, limitations, and the significance of the study.

Background

Effective communication is an essential factor in promoting nurses' willingness to care for patients in the ICU following a public health emergency (Lord et al., 2021). Effective communication between nurses and patients is also crucial for patient safety and comprehension, strengthening the relationship between nurses and patients (Kilgore et al., 2021).

The widespread and mandatory use of face masks in health facilities is a measure adopted to curb the spread of COVID-19 (Lipworth et al., 2021; Mheidly et al., 2020). However, face masks are a hindrance and inconvenience to communication between people wearing them (Mheidly et al.; Vereen et al., 2021). Face masks and face shields

hamper communication among healthcare providers in health facilities (Bandaru et al., 2020).

Many clinicians and healthcare organizations pivoted from in-person encounters with patients to telemedicine to maintain social distancing whenever possible (Coleman, 2020). Research indicates that the sense of comfort with consulting remotely (from home) and technical quality experienced by patients during teleconsultation sessions positively affects the quality of communication between patients and general practitioners (Breton et al., 2021; Kludacz-Alessandri et al., 2021). Patients have also reported a high level of satisfaction in communication with their general practitioners in teleconsultation sessions (Kludacz-Alessandri et al.).

Previous researchers have examined the relationship between telehealth and the quality of communication (Coleman, 2020; Kludacz-Alessandri et al., 2021 & Weinstein, 2020). There is little mask-wearing and the quality of communication (Bandaru et al., 2020; Lipworth et al., 2021; Mheidly et al., 2020; Vereen et al., 2021) understanding of the relative differences in how telehealth and N95 usage affect the quality of nurse-patient communication in hospitals. In this study, I determined if there were significant differences between telehealth services and N95 masks on the quality of communication between nurses and patients.

Problem Statement

Hospitals throughout the United States and worldwide have increased the use of N95 face masks and adopted telehealth communication systems to support infection control and curb the spread of COVID-19 among patients and staff (Totten et al., 2021).

Face masks and telehealth devices are methods that health facilities adopted. However, face masks present challenges to face-to-face communication (Mheidly et al., 2020). For instance, they can dampen speech volume (such as clarity and precision) and thus create a barrier to a patient's ability to comprehend the words spoken by medical personnel. Homans and Vroegop (2021) established a significant difference in speech perception among participants when a speaker is wearing a face mask compared to when they were not wearing a mask. Despite people reporting positive communication experiences in telehealthcare overall (Catalan-Matamoros et al., 2021), communication during telehealthcare is also associated with its fair share of challenges. Telehealth communication is prone to barriers such as difficulty accessing and using technologies used for remote care (Breton et al., 2021). It is also associated with problems in diagnosing patients without direct physical examination. Remote communication limits the observation of non-verbal cues while assessing a patient (Breton et al.; Brem et al., 2021). Patients and their caregivers need to know how to use specialized technological tools to facilitate telehealth care (Catalan-Matamoros et al., 2021). Telehealth use for emergencies can be detrimental (Breton et al., 2021). In case of an emergency, the health care provider would need to be familiar with the patient's settings to achieve sustainably effective communication (Catalan-Matamoros et al., 2021). Breton et al. (2021) established that a lack of training for specific skills related to remote communication tools negatively affects remote healthcare provision.

Although researchers have investigated this issue, the topic had not been fully explored. The current research lacked studies comparing the relative effects of various

infection control tools used to mitigate the risk of transmission during the COVID-19 pandemic on the quality of interactions between health care providers, specifically nurses and patients in hospital settings. Nurses provide the most patient care and education in hospital settings. Considering that nurses are the medical practitioners who spend the most time with patients in their recovery journey, there is a substantial need to conduct research that delves into how recent measures to support infection control affect the quality of nurse-patient communication. Vereen et al. (2021) asserted that medical personnel are motivated to protect others from COVID-19 and studied the general public's perceptions of using face coverings. The study's findings showed that the participants viewed the use of face coverings as inconvenient because of the discomfort associated with wearing face masks. This discomfort may discourage people from articulating themselves and hence hinder effective communication. According to Lord et al. (2021), effective communication with nurse unit managers about taking care of a COVID-19 patient is essential in motivating nurses to care for patients in the ICU following a public health emergency. Whether nurses have similar or divergent views from those of the general public regarding the use of face masks remains unknown. Their perceptions regarding the effects of face masks on nurse-patient communication have received little attention among researchers.

Although face masks are needed to protect the health of patients and hospital staff, numerous complications are associated with wearing masks (Marler & Ditton, 2021). Marler and Ditton (2021) argued that face masks jeopardize the ability of healthcare staff to communicate with their colleagues and patients. This ideology could

cause inadequacies in service delivery effectiveness, efficiency, and equitability in health facilities. Furthermore, it could also affect the therapeutic intervention procedures conducted by the healthcare personnel (Marler & Ditton, 2021). However, according to Bakhit et al. (2021), who conducted a systematic review, there is insufficient data to quantify all of the adverse effects which may decrease the effectiveness, adherence, and acceptability of face masks. Bakhit et al. (2021) postulated that urgent research is required to mitigate the downsides of wearing face masks and assess possible alternatives.

Kludacz-Alessandri et al. (2021) asserted that telemedicine may play a pivotal role in curbing the spread of COVID-19 by enabling patients' remote care and keeping them protected from unnecessary exposure to the virus. Coleman (2020) observed that COVID-19 has accelerated the usage of telemedicine encounters. Researchers need to study the social dynamics of telemedicine interactions with attention to how telemedicine could affect health disparities.

Understanding the degree to which the mandatory use of N95 masks and telehealth has improved or degraded the ability of nurses to communicate with patients hospitalized with COVID-19 is not well understood. The specific research problem that I addressed in this study was that the effects of N95 masks on the quality of nurse-patient communication had not been compared to that of telehealth technologies within hospitals with COVID-19 patients with nurses' feedback.

Purpose of the Study

The purpose of this quantitative cross-sectional study was to describe the relationship of methods aimed at maintaining social distancing between nurses and patients to nurse-patient communication and to compare differences in the quality of communication when using such methods within the hospital setting. The study's independent variables were the two methods for social distancing (N95 mask or telehealth device), while the dependent variable was the quality of communication. I collected primary data through a survey to assess the quality of communication.

Research Questions and Hypotheses

Research Question 1 (RQ1): What is the relationship between the use of N95 masks and the perceived quality of communication between nurses and patients?

Null Hypothesis (H_01): There is no significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

Alternative Hypothesis (H_11): There is a significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

Research Question 2 (RQ2): What is the relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients?

Null Hypothesis (H_02): There is no significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

Alternative Hypothesis (H_{12}): There is a significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

Research Question 3 (RQ3): Is there a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients?

Null Hypothesis (H_03): There is no statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

Alternative Hypothesis (H_{13}): There is a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

Theoretical Framework for the Study

Two theories grounded this study. These theories were Lewin's (1951) change theory and Shannon's (1948) mathematical theory of communication.

Lewin's (1951) change theory focuses on a three-phased procedure for change: unfreeze, change and refreeze. Unfreezing is where new ideas or way of doing things is brought into play. In this study, I examined how a change in nursing practice by introducing the mandatory use of N95 masks and telehealth devices is perceived to affect communication between nurses and patients compared to telehealth technology. The change (or moving) stage includes the development of new attitudes, values, and behavior in the new state of change. It is the most challenging stage due to a high level of

fear and uncertainty resulting from the change. The change stage relates to the process of developing a level of acceptance of the mandate of wearing N95 masks and the use of telehealth devices to render care for isolated COVID-19 patients over time. The refreeze stage is the time for staff to adapt and become familiar with the practice of the new reality. The new change is established as a new habit in the Refreeze stage. The new pattern becomes the new norm. The new norm during the COVID-19 pandemic is the emergence of wearing facial masks and using telehealth to prevent contracting and or spreading COVID-19 and its variants as routine nursing practice.

Shannon's (1948) MTC explains how the mode of communication might affect its quality. MTC is comprised of a linear communication model, which provides a framework that analyzes how a message(s) can be sent from one person and received by another person. Shannon (1948, p.379) stated, "The fundamental problem of communication is that of reproducing a message sent from one point, either exactly or approximately, to another point." Therefore, this model was designed to develop effective communication between people who need to pass or receive a message. Shannon (1948) found other factors which affected the communication process and referred to them as *noise*.

The MTC's linear communication model postulates that human communication can be subdivided into six essential components: information source, transmitter, channel, noise, receiver, and information destination. The information source is where the message originates (Shannon, 1948). Information source is the first stage where the sender selects the message they desire to pass on. The transmitter (also known as the

encoder) converts the message into signals. Channel is the medium that is used to transmit the signals. Noise refers to any interruption that could result in misunderstanding the message the information source intended to convey. The receiver (also known as a decoder) converts signals back into the message. Finally, the destination is the message's intended recipient (Shannon, 1948).

Nature of the Study

I used a cross-sectional comparative design for this study see Creswell & Creswell (2018). A cross-sectional design was appropriate because I compared two different groups, and data were collected at one given time point. I collected data on the perceived quality of communication between nurses and patients over 7 days using the Nurse Quality of Communication with Patient Questionnaire (NQCPQ; Vuković et al., 2010). I used point-biserial Pearson correlation to determine whether there was an association between N95 use, telehealth use, and the quality of communication. I used an independent samples *t* test to determine whether or not there was a significant difference in the quality of communication when nurses wore N95 face masks versus when they used a telehealth device without wearing face masks. I issued the survey to two groups of nurses. The first group included nurses who used N95 masks to attend to patients. The second group included nurses who listened to their patients via telehealth devices.

Definitions

Communication: The exchange of information, knowledge management, and negotiating (Schoop et al., 2010).

COVID-19: Coronavirus disease (COVID-19) is an infectious disease resulting from the SARS-CoV-2 virus (WHO, 2021). SARS-CoV-2 is an airborne virus that can spread by breathing near an infected person through microscopic particles and droplets emitted by the infected person (Centers for Disease Control and Prevention, 2021).

Face mask: A protective shield that can be made of cloth, paper, or polymers (Howard et al., 2021) and which must cover the nose and mouth as an effective strategy to fight infections (Matuschek et al., 2020). It is designed to trap the respiratory droplets released whenever the person wearing it coughs, talks, or even sneezes (WHO, 2021). It equally works as a barrier protecting the individual against inhaling droplets released by others.

N95 masks: A kind of mask that offers more protection than the standard medical mask by filtering out small and large particles when the person wearing it inhales (WHO, 2021).

Quality Communication: Quality of communication between a nurse and a patient is a measure of the perception the nurse has of the quality of spoken and nonverbal contact with the patient while going about their professional role and based on the patient's rejection or acceptance of their condition, appropriate nursing care and pharmacotherapy in the course of their hospitalization (Vuković et al., 2010).

Telehealth device: An integrated system of screens, cameras, and network access tools (Fang et al., 2020) used to communicate with patients and provide telehealth services.

Telehealth: Electronic devices with telecommunication capabilities to access health care services while practicing social distancing. (Centers for Disease Control and Prevention, 2020).

Assumptions

According to Theofanidis and Fountouki (2019), assumptions are statements that an author of a given study is likely to accept as accurate without proof. In conducting this study, I assumed that the nurses who participated in this study would answer honestly. This assumption was relevant because I solely depended on the respondents' input to develop the final study's findings. In this study, I also assumed that the participants were trained in the proper use of N95 masks. I assumed that telehealth nurses used such devices in a manner consistent with their training. Finally, I considered that the nurses' responses on the quality of communication would represent their communication with patients. I used only nurse respondents and not patients, even though communication is a two-way traffic activity.

Scope and Delimitations

My goal for this study was to understand how the consistent use of N95 masks and telehealth devices affected the quality of communication between nurses and patients. There was a need to compare the effects of N95 masks and those of telehealth devices on the quality of communication between nurses and patients. This specific focus on comparison was imperative. Hospital stakeholders may use the results of this study to understand whether there are significant differences in the quality of communication

when nurses use N95 face masks and when they use telehealth devices to offer healthcare services.

According to Theofanidis and Fountouki (2019), delimitations are boundaries that are set, determined, and controlled by a given study's author to examine the study's purpose and research questions. The study population was two units of registered nurses at an acute care hospital in a large metropolitan area of the United States. One unit attends to patients using N95 face masks, and another unit listens to patients via telehealth devices in the hospital. Other healthcare providers were excluded because nurses spend the most time with patients and thus communicate the most with patients in performing their roles, such as history taking in Fawcett & Rhynas (2012).

Before settling for Lewin's (1951) the change theory and Shannon's (1948) MTC, I considered adaptive structuration theory (AST) for this study. Poole and DeSanctis advanced the AST to illustrate the impact of information technologies and communication in organizational processes, such as change (Scott et al., 2017). The theory focuses on the dynamic relationship between structures availed by technologies and how such structures are used by people (DeSanctis et al., 1993). It is mainly designed to facilitate the analysis of between-group differences (Scott et al., 2017). The AST emphasizes resources from institutions and technologies, social structures, and rules as the basis for human activity (DeSanctis et al.).

I did not select the AST for this study for two reasons. First, the AST requires longitudinal observation of the discourse under investigation about the technology (Scott et al., 2017). This is the main reason for not using the theory because this study is a cross-

sectional design research study. Secondly, the theory has a level of complexity that can prove difficult and confusing to follow (Scott et al., 2017). Despite conducting this study in one hospital, the results may be generalized to similar settings because of the nature of the nursing practice. The nursing profession has the most significant direct contact with hospitalized patients, the ubiquity of the need for clear nurse-patient communication, and the COVID-19 pandemic has forced hospitals to change how nurses interact with their patients to institute methods to maintain infection control.

Limitations

Limitations refer to weaknesses of a research study design that can affect the study's outcome (Creswell & Creswell, 2018). In this study, I used a cross-sectional research design to examine the presence or absence of a significant difference in the effects of N95 masks and telehealth devices on the quality of communication between nurses and patients. According to Di Girolamo and Mans (2019), cross-sectional studies yield prevalence results instead of cohort studies that produce incidence results. Therefore, one primary limitation of this cross-sectional study was that it could only provide information about differences in the quality of communication for the period in which the data was collected (Di Girolamo & Mans, 2019). Any differences in the quality of communication that may have existed between the units before the implementation of N95 masks and telehealth devices cannot be known. Further, any changes in the quality of communication after the data collection period cannot be predicted.

I only explored nurses' perceptions of effective communication and did not address patient experiences. I conducted this study in a single site, which limited the generalizability of the findings.

Significance

This study is significant because I compared how specific infection control measures may affect the quality of communication in hospital settings. Specifically, I examined the degree to which N95 masks and telehealth devices have enhanced or restricted communication between patients and nurses is now better understood. The results of this study can be used to support professional practice in several ways. Results from my study indicated N95 face masks degrade the quality of communication between nurses and patients while telehealth devices enhance the quality of communication between nurses and patients. In this case, the study supported the adoption of such devices in healthcare facilities.

The findings from this study can be used to create positive social change by improving safety in the clinical setting. Organizations can determine the quality of communication by choosing the best tools to prevent the spread of infection and ensure clear and accurate provider-patient communication, preventing medical errors. This may also improve the relationship and rapport between nurses and patients and steer cooperation between nurses and patients.

Finally, the study's findings will add to the existing literature on communication in health facilities. This will facilitate future research to have a solid background while undertaking their respective studies.

Summary

There has been widespread adoption of face masks and telehealth communication systems to support infection control in health facilities. Nurses spend the most time with patients in hospital settings, providing them with care in their recovery journey. Because effective communication has been shown to be a key factor in the interaction between nurses and patients, there was a need to examine how these N95 face masks and the use of telehealth affect the quality of nurse-patient communication.

This chapter included the background of the study in which I highlighted literature related to the scope of my study, the problem statement, and the purpose of the study. I also presented three research questions together with their respective hypotheses, outlined the theoretical framework for the study, nature of the study (including the research design, data collection instrument, and statistical tests that used to analyze data), defined the key terms of the study, given assumptions, scope and delimitations, limitations, and the significance of the study. In Chapter 2, I will discuss the literature search strategy, detail the study's theoretical framework, and give a detailed discussion of the key variables that I used in this study.

Chapter 2: Literature Review

Introduction

The enforcement of preventive measures against COVID-19 resulted in the normalization of N95 face mask usage in health facilities. The use of telehealth devices has been expanded wherever possible to minimize physical contact between medical personnel and patients (Monaghesh & Hajizadeh, 2020). Considering that nurses are the medical practitioners who spend the most time with patients in their recovery journey, there is a need to understand how recent measures to prevent transmission or infections affect nurse-patient communication. Thus, the purpose of this quantitative cross-sectional study was to describe the relationship of methods aimed at maintaining social distancing between nurses and patients to nurse-patient communication and to compare differences in the quality of communication when using such methods within the hospital setting, specifically the use of N95 masks and telehealth devices.

Research has been conducted on nurse-patient communication and the effects of telehealth devices and face masks. Successful nursing interventions depend on a nurse's comprehension of communication and interpersonal relations with a patient (Kourkouta & Papathanasiou, 2014). High-quality communication is crucial in providing high-quality healthcare services that result in patient satisfaction (Lotfi et al., 2019), improved health (Norouzinia et al., 2016), and reduction in medical errors that could otherwise result in patient harm (Dingley et al., 2018). Face masks (e.g., Bandaru et al., 2020; Mheidly et al., 2020; Saunders et al., 2021; Vereen et al., 2021) and telehealth devices (Morony et al., 2018; Rothwell et al., 2012) have an impact on the quality of communication between

patients and providers. However, a gap exists in the literature in that no studies have been done to compare the effects of telehealth versus face masks on communication between nurses and patients. In this study, I examined the quality of communication when using N95 masks versus telehealth devices.

This chapter includes the literature search strategy, the theoretical framework, and the literature review of the study's key variables. The literature search strategy, the theoretical framework, and the literature review supported key variable.

Literature Search Strategy

I explored available literature on the impact of telehealth communication on the quality of communication between nurses and patients. I used the following databases to search for literature: Proquest, PubMed, CINAHL, EMBASE, and Sage Journals. In addition to these databases, I conducted a Google Scholar search to look for other journals relevant to this study. The following keywords were explored in the databases: *COVID-19-related communication, N95 masks, telehealth, facemasks in healthcare facilities, patients, nurses, communication in the healthcare sector, nurse-patient communication, hospitals, and acute care*. I searched the databases for peer-reviewed articles published between 2017 and 2021.

The total number of articles derived from the initial search was 77. Upon excluding the irrelevant articles and those which lacked the study's key terms, 26 articles were used in this literature review.

Theoretical Foundation

My study was grounded on Shannon's (1948) MTC and Lewin's (1951) change theory. MTC and the change theory were the best fit for nurse-patient communication with isolated patients in an acute care setting.

Shannon's Mathematical Theory of Communication (MTC)

Shannon (1948)'s MTC focuses on communication and how the mode used to send a message can affect the quality of communication. In theory, Shannon (1948)'s definition of communication is that communication is a broad concept that includes all procedures through which one mind could affect another: a written message, oral speech, music, art, ballet, theater, and human behavior at large.

The theory acknowledges three levels of communication problems: Levels A, B, and C. Level A is how accurately communication symbols can be transmitted. Level B is precisely the communication symbols sent to pass the intended message (accuracy). Lastly, the Level C problem is the efficacy of the received message to affect conduct in the manner desired by the sender of the message (Shannon & Weaver, 1964).

Shannon's (1948) communication theory is built on the foundations of some researchers at Bell Labs, like R.V.L. Hartley and Harry Nyquist. However, Shannon's (1948) published paper surpassed the limits of its earlier work. Shannon's paper clarified primary information channels so solidly that his terminology and framework are used to date (Goldie & Pinch, 1991).

Shannon (1948) distinguished the technical problem of message delivery from the problem of understanding the conveyed message. Shannon (1948) was keen on

determining the most efficient way of encoding a message in a noiseless environment and understanding the additional steps which may need to be pursued amid the noise. The theory acknowledges both discrete and continuous modes of communication and addresses analog and digital systems. Shannon (1948) developed the concept of linguistic entropy to measure the efficiency of communications that measure the amount of disorder in physical systems. The entropy was computed based on the statistical properties of the source of the message.

MTC is comprised of a linear communication model, which provides a framework that analyzes how a message(s) can be sent from one person and received by another person. The MTC's linear communication model postulates that human communication can be subdivided into six essential components: information source, transmitter, channel, noise, receiver, and information destination. The information source is where the message originates (Shannon, 1948). Information source is the first stage where the sender selects the message they desire to pass on. The transmitter (also known as the encoder) converts the message into signals. Channel is the medium that is used to transmit the signals. Noise refers to any interruption that could result in misunderstanding the message that the information source intended to convey. The receiver (also known as a decoder) converts signals back into the message. Finally, the destination is the message's intended recipient (Shannon, 1948).

Previous Applications of MTC

A review of the literature revealed that limited studies included MTC as the framework (e.g., Brady et al., 2017; Elleström, 2018; Soyak & Ercetin, 2022; Roberts,

2022; Strinati et al., 2021; Umeozor, 2010; Walleczek & Grössing, 2016; Wooldridge et al., 2018) had a focus on communication. A few of the studies were conducted in healthcare settings (e.g., Brady et al., 2017; Roberts, 2022; Wooldridge et al., 2018).

Elleström (2018) used MTC in the process of creating a new medium-centered model of human communication. Soyak and Ercetin (2022) used MTC as an enabler (to support) the upcoming 6G use cases. Soyak and Ercetin (2022) argue that MTC is necessary to support such applications as 6G. Strinati et al. (2021) built on the MTC paradigm of guaranteeing the correct reception of every single transmitted bit and promoted the idea that including semantic and goal-oriented aspects in future 6G networks will help improve system effectiveness and sustainability. Umeozor (2010) used MTC as a theoretical background in studying the communication process in the 21st Century Library. Walleczek and Grössing (2016) use MTC as a conceptual framework to distinguish types of signals.

Brady et al. (2017) used MTC as a framework to examine the barriers to effective, safe communication and workflow between nurses and non-consultant hospital doctors during out-of-hours. The authors also used MTC to evaluate the type and nature of communication and workflow arrangements between nurses and doctors out-of-hours (OOH). Wooldridge et al. (2018) used MTC as a framework to examine how primary care teams communicate to allocate tasks. Roberts (2022) used MTC to construct semi-structured interviews to explore nurses' described perspectives of the electronic health record (EHR).

Rationale for MTC Model of Communication

The MTC selected for use in this study because it is the only model that was found to account for physiological aspects of communication, such as communication over physical barriers (N95) and distance (telehealth). The MTC model focuses on channels of and barriers to communication (Brady et al., 2017). Further, MTC also selected because it has been used in multiple studies in the field of communication to enhance the understanding of variables that involve transmitting information from one person to another through a medium. MTC is, therefore, the model that best explains the potential effects of the use of N95 masks and telehealth devices on the quality of communication.

Lewin's Change Theory

Change is a common feature of modern-day organizations and institutions, necessitating leaders to inspire their followers and staff to endorse new work-related behaviors (Okantey, 2012). The LCM is a comprehensive illustrative description of the rationale for how an anticipated change is projected to happen in a specific context. It principally acts to map out (fill in) what has been labeled as the "missing middle" between what a program initiative does vis-à-vis how the interventions help achieve the desired goals. The collaboration of leaders and employees is essential for success vis-à-vis the implementation of strategies by leaders of organizations (Okantey, 2012).

The roots of the change theory were generated by Kurt Lewin, a social and organizational psychologist in the early 1940s. Being a psychiatrist, Lewin evaluated

group behavior and change, which contributed to the development of this theory (Burnes, 2004).

Three-Step Change Model

Lewin introduced the three-step change theory in 1951. The foundational force-field approach by Lewin suggested the formation of the increasing and dynamic nature of several forces in social contexts. The change theory encompassed group dynamics, field theory, action research, and the three-step change model. Lewin formed the action research, a more change framework for evaluating and determining organizational complications and conflicts. He used the unfreeze–change–refreeze process as a preliminary change management phase.

Step 1: Unfreezing. The first step of this process involves *unfreezing* current practices. *Unfreezing* of the status quo is achieved by forming the employee's perception and cognizance of change. Eden et al. (2016) described the status quo as the equilibrium state, which indicated a stable level of contrasting forces. The main emphasis of the *unfreezing* step is the formation of processes and structures to back up the new change initiatives. According to Burnes (2004), the *unfreezing* stage creates awareness regarding change and destabilizes the organization's environment. Organizations ought to keep themselves prepared for resistance during the change process since often the efforts evoke negative responses vis-à-vis the proposed change.

Step 2: Change. The second stage includes the actual change and involves action and transition to the desired norm. It encompasses a new functional state inclusive of the execution of the anticipated change. In this phase, organizations formulate new strategies

for implementing work, a new vision, operational structures, and new skill-supportive models (Medley & Akan, 2008). Organizational management develops new behaviors, executes change, and maintains stabilization. Lewin emphasizes that organizational leaders should be prepared to battle uncertainties and accommodate innovative ideas in developing new processes vis-à-vis change. Medley and Akan (2008) argue that the actual *change* phase is dependent on the acceptance of the original vision and the organizational direction by the employees.

Step 3: Refreezing. The third step involves *refreezing* the equilibrium to ensure that new deeds are incorporated into the organization. At this stage, people readily accept the newly implemented processes. Medley and Akan (2008) stated that the phase of *refreezing* principally refreezes the equilibrium to ensure new deeds. When the employees break their habits and detach from the existing condition, organizational leaders refreeze the desired change outcome. The leaders achieve *refreezing* by momentarily replacing limiting forces with enduring reinforcement. Raia (1987) recognizes that the refreezing phase is mainly concerned with the consolidation and stabilization of the new behavior in the workplace.

Lewin considered one's distinctive psychological aspects as part of the group dynamics. Hussain et al. (2018) conducted a study to review change management by applying the three-phase change model by Lewin. The study findings indicated that leaders and employers form one unit using Lewin's change model to transition from one phase to another. Furthermore, Hussian et al. (2018) considered Lewin's change model beneficial because applying organizational change methods and structures can lead to

change success. Therefore, organizational leaders ought to comprehend the change process to inform their development and management of change initiatives during implementation (Pollack & Pollack, 2014).

Previous Applications of LCM

I searched and discovered seven studies Boyd et al. (1992), Carreon and Dutra (2020), Coulter (2021), Tetef (2017), and Woody (2020) in the field of healthcare grounded in the LCM. None of the studies used the LCM to specifically study the effects of facemasks on communication. However, two of the studies Carreon and Dutra (2022) and Tetef (2017) used the LCM to study the use of telecommunication technologies in nursing.

Coulter (2021) conducted a qualitative study that used the 3-steps of LCM to categorize themes used to retrospectively analyze an outpatient facility's change efforts in response to COVID-19. Boyd et al. (1992) used the LCM as a framework to conceptualize, plan, and implement organizational change in an inpatient long-term care facility. Woody (2020) used LCM's 3-steps to create a conceptual framework for a Military Health System genesis implementation.

The LCM was used as the framework for two studies involving the use of technology, specifically telehealth by nurses. Tetef (2017) used the LCM to describe the process of integrating the use of new technology into nursing practice. Communication was emphasized in establishing a collaborative approach toward the process of integration. Similarly, Carreon and Dutra (2020) used the LCM to frame their study, which examined how the integration of a telecommunication device affected several

nursing outcomes, including communication. The authors asserted that the LCM was appropriate to explain the organizational and informatics-related changes needed for successful integration.

Rationale for Choosing Change Theory

The outbreak of the COVID-19 pandemic introduced the mandatory use of N95 masks in hospitals and the adoption of telehealth technology to combat the spread of COVID-19. This abrupt practice change was required to step up protective measures to quell the spread of infection. Lewin's change theory can explain how such measures were accepted and integrated into routine practice.

Having to use N95 face masks or a telehealth device in all instances was a significant change to contend with. LCT was thus selected as one of the frameworks for this study because it provides a systematic three-step approach to explore nurses' acceptance of the routine use of N95 masks and telehealth devices while attending to each of their patients.

Relationship of Research Questions to the MTC and LCT

The MTC model reflects on the process of communication and how it may be affected differently with the use of the two protective measures (otherwise barriers to communication) being examined in this study - telehealth systems and the wearing of N95 face masks. The first and second research questions will explore how the quality of communication is affected by the use of N95 masks and telehealth devices. According to the MTC concepts of senders and recipients, nurses must encode and decode messages while wearing a barrier, the N95 mask. Similarly, the model will be essential in

explaining how telehealth might facilitate communication and reduce barriers and noise in the communication process.

The LCT model is a three-step model which examines how change is embraced. According to Lewin (1951), the first step in change is unfreezing. The destabilization of existing practices brought on by the COVID-19 pandemic through the mandatory use of face masks and the increased use of telehealth devices within hospitals reflects Lewin's concept of unfreezing. The second stage is the moving stage which involves developing new attitudes, values, and behavior in the new change state. The second stage is considered the most challenging stage due to the uncertainty of following the new way of doing things. This stage relates to the process of developing a level of acceptance of the mandate of wearing N95 masks and the use of telehealth devices to render care for isolated COVID-19 patients over time. Lastly, the refreezing stage gives people time to adapt, familiarize themselves with practicing the new reality, and develop it into a habit. In this study, this stage relates to the new normal of wearing face masks and telehealth devices to prevent the spread of the COVID-19 pandemic. However, individuals experiencing change might progress through the LTC's stages at different rates and thus express different attitudes at a given point in time. The LTC can help explain the process of change at the group or organizational level and also the variation between individuals in progression through the stages. Thus, in this study, the LTC explains how perceptions regarding the quality of communication with the use of N95 masks and telehealth devices may be influenced by the level of acceptance of this practice change by individual participants at the time of the data collection.

Literature Review Related to Key Variables

Quality of Communication and Patient Outcomes

Communication is a fundamental concept that is integral to nursing as a profession (Nikmanesh et al., 2018). The research examining outcomes associated with nurse communication has focused on patient outcomes involving compliance and satisfaction.

Patient Compliance

Compliance is considered one of the key indicators of effective health systems (Stormbroek, 2020). Research has shown that effective communication is associated with patient compliance (e.g., AlOmari, 2021; Chang et al., 2022; Lu & Zhang, 2019). The literature reviewed on patient compliance has been conducted with various research designs and populations. For example, Lu and Zhang (2019) and AlOmari (2021) conducted quantitative cross-sectional studies. Lu and Zhang (2019) investigated the impact of physician-patient communication on patient compliance in Online Health Communities (OHCs). The 423 participants were Chinese individuals who had communicated with physicians in OHCs the previous month. A convenience sampling technique was used to select the participants. The authors used the self-determination theory to define their study's variables. Lu and Zhang (2019) developed their own data collection instrument and calculated the Cronbach alpha of each of their constructs. All the constructs returned Cronbach alpha values greater than 0.7, thus ascertaining their data collection instrument to be highly reliable. The effects of three mediator variables were examined: perceived quality of internet health information, physician-patient

concordance, and decision-making preference on the relationship between physician-patient communication and patient compliance. The study's findings suggest that physician-patient communication in OHCs positively impacts patient compliance. All three mediator variables (perceived quality of internet health information, physician-patient concordance, and decision-making preference) were significant mediators of the relationship between physician-patient communication in OHCs and patient compliance. Patients' decision-making preferences showed the weakest impact on patient compliance compared with the other two mediators.

In another research study using the same design, AlOmari (2021) examined the impact of nursing care on patient satisfaction and behavioral compliance from the patient perspective in the Syrian capital of Damascus. The author used a conceptual framework whose model comprised of the following aspects: listening and explanation skills, responsiveness, service friendship and morality behavior, behavioral compliance, organizational image, and patient satisfaction. The study's 450 respondents were patients who came to hospitals at least twice and were selected based on convenience sampling. Nurses' communication skills were one of the leading indicators of nurse care (AlOmari, 2021). The researcher defined *nursing communication* as listening and explanation skills. The author used the Service Quality (SERVQUAL) instrument in data collection and reported construct reliability of more than 0.7 for all the constructs used in the study. The study's findings revealed that nurses' communication skills significantly affect patient satisfaction. Listening and explanation skills, responsiveness approach, and service

friendship behavior account for approximately 64% of the variance in behavioral compliance.

Similarly, Chang et al. (2022) conducted a quantitative longitudinal study between September 2016 and January 2017 to examine the bidirectional relationship between communication and cognitive abilities on orthopedic patient adherence behavior. The authors used behavioral theory to build on the model of their study. The 397 respondents were patients at the orthopedics departments of eight hospitals in Taiwan who were sampled using the convenience sampling method. The authors designed a data collection questionnaire based on the examined variables. They assessed the internal consistency reliability of the measured variables using Cronbach's alpha, which all measured above 0.7, thus indicating that their measures had reasonably high levels of reliability. Chang et al. (2022) conceptual model was constructed based on the following variables: physician-patient communication, healthcare structure, cognitive efficacy, adherent behavior, and healthcare outcome. Like Lu and Zhang (2019), AlOmari (2021), and Chang et al. (2022) revealed that physician-patient communication has a significant effect on the adherence behavior of patients.

In summary, Lu and Zhang (2019), AlOmari (2021), and Chang et al. (2022) established a significant relationship between physician-patient communication and patient compliance & adherence behavior. There is consistency across the findings that the quality of communication between the provider and the patient affects patient compliance.

Patient Satisfaction

One of the main goals of nursing is to provide good nursing care to all patients that will yield desirable patient outcomes such as patient satisfaction (Liu et al., 2014). Recent studies Barilaro et al. (2019); Lotfi et al. (2019); Mangun (2018); Nikmanesh et al. (2018) have shown a relationship between patient satisfaction and communication in healthcare facilities. In contrast, the failure to communicate effectively can cripple the function of healthcare providers.

For instance, Mangun (2018) conducted a quantitative correlational study to determine if there was a relationship between nurse-patient communication and patient satisfaction. The study's participants were patients from a hospital in Illinois. Patient satisfaction levels were measured as part of the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. The author did not, however, report the reliability of this data collection instrument. Mangun (2018) used Hildegard Peplau's theory of interpersonal relations in the study's theoretical framework. The findings indicated that patient satisfaction levels were high where positive scores were reported in communication with nurses. These findings suggest that nurses' reports of the quality of communication provide a reliable indication of patient perceptions.

Nikmanesh et al. (2018) also conducted a quantitative cross-sectional study to investigate the effect of communication skills training of nurses on patient satisfaction. The 581 participants were nurses in teaching hospitals in Iran and were selected using convenience sampling. Nikmanesh et al. did not identify the use of a theoretical framework in their study. The authors used the NQCPQ questionnaire to assess the

quality of communication, and the reliability of the instrument was assessed using Cronbach's alpha ($\alpha = 0.87$), indicating a high level of reliability. Like Mangun (2018), Nikmanesh et al. found a significant correlation between nurse-patient communication and patient satisfaction.

In the same vein as Mangun (2018); Nikmanesh et al. (2018), and Lotfi et al. (2019) conducted a descriptive correlational study to assess the relationship of nurse-patient communication to patient satisfaction in burn wards. The study's 295 participants were patients admitted to the burn wards at a hospital in Iran and were sampled using convenience sampling. Lotfi et al. (2019) did not identify using a theoretical framework in their study. The NQCPQ questionnaire was used to measure the quality of communication. The authors assessed the instrument's reliability and found it to have a Cronbach's alpha of 0.87, indicating a high level of reliability. The study's findings were similar to those of Nikmanesh et al. (2018) revealing a correlation between the quality of nurse-patient communication and patient satisfaction with nursing care.

One last example illustrating the relationship between patient satisfaction and communication is the research of Barilaro et al. (2019). They conducted a quantitative cross-sectional study to assess the degree of patient satisfaction in relation to nursing communication at various stages of their hospital stay. The authors developed their questionnaire for data collection but did not report the instrument's reliability in their study. Barilaro et al. also did not identify the use of any theoretical framework in their study. The 1,162 participants were patients admitted to a hospital in Italy. Their results

mirrored those of Mangun (2018), Nikmanesh et al. (2018), and Lotfi et al. (2019):

Nursing communication is significantly associated with patient satisfaction.

In conclusion, these reviewed studies AlOmari (2021); Barilaro et al. (2019); Lotfi et al. (2019); Mangun (2018); Nikmanesh et al. (2018) revealed consistent findings that there is a significant relationship between nurse-patient communication and patient satisfaction. Taken together, the findings of these studies support the assertion that communication is a crucial component of healthcare service providers that has significant effects on patient outcomes. Depending on how it is managed therefore, nurse-patient communication can inform relatively desirable or undesirable patient outcomes.

Strengths and Weaknesses

A major strength of the reviewed studies is that they used relatively large sample sizes, with all but one (Mangun, 2018) ranging from 397 (Chang et al., 2022) to 1,162 (Barilaro et al., 2019). This approach ensured that a study's findings represent the examined population. Two of the seven studies Lotfi et al. (2019) and Nikmanesh et al. (2018) reviewed in this section used the NQCPQ questionnaire (the instrument I will use in my study) to measure the quality of communication, and the two studies yielded similar results. This finding promotes a sense of consistency in findings from these studies. Three of the seven studies AlOmari (2021); (Chang et al. (2022) and Lu & Zhang (2019) reviewed studies reported the reliability of the data collection instruments they used, and all the instruments demonstrated high reliability (Cronbach alpha > 0.7).

Four out of the seven AlOmari (2021); Chang et al. (2022); Lu & Zhang (2019); Mangun (2018) reviewed studies reported the use of either a conceptual or theoretical

frameworks to ground their studies. Five of the seven studies AlOmari (2021); Barilaro et al. (2019); Chang et al. (2022); Lotfi et al. (2019) and Mangun (2018) reviewed studies included patients, while six AlOmari (2021); Barilaro et al. (2019); Chang et al. (2022); Lotfi et al. (2019); Mangun (2018) and Nikmanesh et al. (2018) were conducted in hospital settings. Moreover, all studies were correlational. Whereas correlational research studies uncovered relationships that were not known, they did not provide a temporal link or definitive explanation for the connection between variables. None of the studies examined how different barriers to communication might affect patient outcomes. In addition, few of these studies were conducted in the United States. Lastly, only one of the reviewed studies (AlOmari, 2021) specifically included nurses as opposed to the other studies, which included different healthcare workers.

Face Masks and the Quality of Communication in Healthcare Settings

The interest of scholars in understanding how the use of masks affects communication in the healthcare environment has risen in response to the need for infection control during the current COVID-19 pandemic (e.g., Bandaru et al., 2020; Chu et al., 2021; Homans & Vroegop, 2021; Langbehn et al., 2020; Malik et al., 2021; Rahne et al., 2021; Ritter et al., 2022; Saunders et al., 2021; Vitale et al., 2021).

In one example, Bandaru et al. (2020) conducted a quantitative observational study to examine the effects of N95 masks and face shields on speech perception among 20 healthcare workers during the COVID-19 pandemic. The health workers who participated in the study were from the outpatient ENT clinic of a tertiary care referral center in south India. Pure tone audiometry was carried out to ensure normal hearing in

each participant, and each participant's ear was assessed separately, thus making the sample size 40. The authors developed their data collection instrument but did not report its reliability. Bandaru et al. did not identify the use of any theoretical framework in the study. Speech discrimination scores and speech reception thresholds were obtained without using face protective equipment, and the process was repeated with an N95 mask and face shield. The study's findings indicated that using face masks, face shields, and other personal protective equipment significantly negatively affects speech perception and comprehension. Therefore, the researchers recommended that alternative communication strategies be developed to ensure effective communication.

Similarly, Langbehn et al. (2020) conducted a quantitative study to test the hypothesis that wearing N95, surgical, and cloth face masks compromises the perception of emotions. The study's variables were four expressions: happiness, anger, surprise, and disgust. These expressions were examined in relation to their conveyance when people are covered by N95, surgical, or cloth masks versus when they are not covered. The study's 60 participants were recruited using convenience sampling, with the data collected using a survey on the Qualtrics online survey platform. The authors developed their survey but did not report its reliability. Langbehn et al. also did not identify their research design or use of a theoretical framework in their study. The findings demonstrated that masks impair the perception of smiles because face masks cover the mouth, which is used to express a smile. The study also revealed that perceiving information is less compromised for expressions of surprise and anger. These emotions involve more signals on the upper portion of the face, which is not covered by face

masks. Like Bandaru et al. (2020), Langbehn et al. thus recommended that people increase the communication of emotions via modalities that are not compromised by face masks.

Another example of research addressing how face masks affect communication in healthcare settings is the work of Chu et al. (2021). They conducted a cross-sectional quantitative study to assess healthcare workers' and patients' perceptions of communication and their ability to identify emotion while wearing transparent, standard masks. The study's authors recruited a sample of 1,000 members of the general public, 123 healthcare workers, and 45 healthcare workers who were hearing impaired. Convenience sampling was used to recruit the participants of the study. The study's variables included the use of standard masks, transparent masks, and the ability to read emotions. The authors developed their survey questions based on previously published surveys and used them to collect the data, but they did not report the instrument's reliability nor indicate the use of any theoretical framework. These survey questions measured the ability to read emotions using standard masks and transparent masks. The findings revealed that reading emotions were significantly improved with transparent masks compared to standard opaque N95 masks. Based on these findings, they asserted that standard opaque N95 masks have a negative impact on the quality of communication as they deter the ability to identify emotions. These results reaffirm those of other researchers, including Bandaru et al. (2020), and Langbehn et al. (2020).

An additional research study on the topic of masks and communication is that of Homans and Vroegop (2021). They conducted a quantitative observational study to

assess the effect of face shields and surgical masks on the speech comprehension of people with moderate to severe hearing loss. The sample consisted of 42 patients with severe to moderate hearing impairment at a tertiary referral center in Rotterdam in the Netherlands. Nineteen of the patients had hearing aids, while 23 had cochlear implants. The study explored speech tracking scores in three conditions using a face shield, with a surgical mask, and without a mask. The acoustic effects of the face shields and masks on the speech signal were also assessed. The authors used the speech tracking test instrument to collect data, but they did not report the instrument's reliability. Homans and Vroegop (2021) did not identify the use of any theoretical framework in their study. This study revealed a significant difference in speech perception scores when using a face mask compared to without a mask. The worse the speech comprehension in a quiet environment, the more significant the impact of the surgical mask. The results showed that face shields had a negative effect on speech perception for people with lower speech perception scores in quiet environments. The sound distortion was more significant for the face shield than for the surgical mask. Echoing the results of other studies, Homans and Vroegop (2021) concluded that face coverings negatively impacted communication, especially among patients with moderate to severe hearing loss.

Malik et al. (2021) also conducted a quantitative study in which they used a randomized experimental research design to investigate the impact of facemasks on the level and quality of communicational trust during COVID-19. A random sample of 1867 U.S. citizens were recruited in July and August 2020 to participate in the study. An experimental game created by the researchers was used to collect data from the sample.

Malik et al. did not however report the reliability of their data collection instrument. The authors also did not identify the use of any theoretical framework in the study. The study's variables included interpersonal trust, perceived health risks, and perceived economic risks. The study findings indicated that 5% fewer individuals trusted advice given by people wearing masks than those without masks. Based on the findings of this study, it is evident that the use of facemasks is associated with lower levels of trust, which could affect the quality of communication, even in health-related matters.

In yet another quantitative study, Rahne et al. (2021) used an observational cross-sectional research design to examine the influence of N95 and surgical face masks on listening effort and speech perception in an environment with some background noise. The study's variables included speech recognition, listening effort, background noise, and the use of N95 masks. The study's 17 participants were people with normal hearing and recruited using the purposive sampling method. Recruitment took place between November 2020 and January 2021 in Halle, Germany. Rahne et al. (2021) developed their data collection instrument but did not report its reliability. The authors also did not identify the use of any theoretical framework in their study. The study found that speech perception in noisy environments was significantly reduced if a medical face mask was placed between the source of speech and the person listening. Reductions were found to be greater with the use of N95 face masks. This is hand in hand with Langbehn et al. (2020)'s findings on N95 face masks.

Saunders et al. (2021) conducted a mixed methods study to investigate the effects of face coverings on hearing and communication. The data was collected using an online

survey developed by the study's authors in the U.K., but they did not report the instrument's reliability. A total of 465 members of the general public recruited using snowball sampling participated in the study. The key concepts in the study include face coverings, masks, hearing, communication, visual cues, and facial expressions. Four themes were identified in relation to communication: delivery (this theme reflected changes such as clearer, slower, and louder linguistic content), body language, awareness of others' needs, and inward changes. The variables used in the quantitative portion of this study were self-reported hearing, the use of hearing aids, and communication associated with face coverings. Saunders et al. (2021) found out that face coverings have far-reaching impacts on communication for all people who use them, and even worse impacts on people with hearing loss. These findings reinforce the findings of Bandaru et al. (2020), Chu et al. (2021), Homans & Vroegop (2021), Langbehn et al. (2020), Malik et al. (2021), and Rahne et al. (2021) in relation to face masks and communication.

Another quantitative study was conducted by Vitale et al. (2021) to assess how the required use of face masks influenced the quality of nurse-patient communication. The authors assessed the influence of face masks by comparing the perceived quality of communication before the Covid-19 pandemic and after the Covid-19 pandemic (when face masks were in use). The study's 178 participants included 118 nurses and 60 patients who were recruited using convenience sampling. The study aimed to evaluate how nurses and patients perceived the required use of the face mask as a protective measure against the SARS-CoV-2 infection and whether the use of face masks positively or negatively influenced nurse-patient communication. Vitale et al. (2021) also did not identify the

research design used or the use of any theoretical framework in their study. The authors used the Quality of Communication Questionnaire (QOC) to measure the quality of nurse-patient communication, but they did not report the instrument's reliability. While nurses reported that the quality of communication had decreased, citing masks as obstacles to communication, patients did not report significant differences in their perceptions of the quality of nurse-patient communication before and during the COVID-19 pandemic when the use of face masks was in place (Vitale et al.). In this way, Vitale et al.'s findings minimally contrasted the findings of Bandaru et al. (2020), Chu et al. (2021), Homans and Vroegop (2021), Langbehn et al. (2020), Malik et al. (2021), Rahne et al. (2021) and Saunders et al. (2021) findings which unanimously revealed negative impacts of face masks on communication.

The last example in this section is Ritter et al. (2022)'s quantitative research on the impact of face masks on speech recognition in adult patients in a clinical setting. A total of 45 participants were included in the study. The study's respondents were from an otolaryngology clinic and were individuals with normal hearing and some with a degree of hearing loss. The study's variables included word recognition without a mask, word recognition with an N95 mask, and word recognition with a surgical mask. The results indicated that face masks significantly decreased word recognition, which was worsened with using N95 masks, especially in patients with hearing loss. These findings are consistent with all studies that have been reviewed in this section (e.g., Bandaru et al., 2020; Chu et al., 2021; Homans & Vroegop, 2021; Langbehn et al., 2020; Malik et al., 2021; Rahne et al., 2021; Saunders et al., 2021) save for Vitale et al. (2021). Whereas face

masks are crucial in allowing for safe patient-physician interactions, clinicians must be aware that the masks could create a barrier to effective communication (Ritter et al., 2022).

All the reviewed studies (e.g., Bandaru et al., 2020; Chu et al., 2021; Homans & Vroegop, 2021; Langbehn et al., 2020; Malik et al., 2021; Rahne et al., 2021; Ritter et al., 2022; Saunders et al., 2021) but one (Vitale et al., 2021) are consistent with their findings that face masks, and other face coverings have a significant effect on the quality of communication between individuals, especially in the health sector settings. Whereas Vitale et al. did not find significant differences in patients' perceptions of the quality of nurse-patient communication, the authors observed that nurses recorded lower perceptions of the quality of communication, citing masks as obstacles to communication (Vitale et al., 2021). The contradiction on the side of patients could result from nurses' resilience to provide quality health care despite the barrier created by face masks. N95 masks exacerbate speech perception and word recognition (Rahne et al., 2021; Ritter et al., 2022). People with hearing problems were also more adversely affected by face masks as barriers to communication between patients and healthcare workers (Homans & Vroegop, 2021; Ritter et al., 2022; Saunders et al., 2021).

Strengths and Weaknesses

The main strength observed in this section is that most of the studies reviewed in this section (eight out of nine) were quantitative studies (e.g., Bandaru et al., 2020; Chu et al., 2021; Homans & Vroegop, 2021; Langbehn et al., 2020; Malik et al., 2021; Rahne et al., 2021; Ritter et al., 2022; Vitale et al., 2021), setting good precedence for this

quantitative study. Although only one study focused on nurses (Vitale et al., 2021), the reviewed literature in this section consisted of studies conducted in healthcare settings, the targeted population. There was also a wide variation in how different studies measured communication quality. All nine reviewed studies used different instruments, with six of them having been developed by the studies' authors based on different parameters (e.g., Bandaru et al., 2020; Chu et al., 2021; Langbehn et al., 2020; Malik et al., 2021; Rahne et al., 2021; Saunders et al., 2021; Vitale et al., 2021). This finding makes it difficult to compare the findings across studies and make consistent conclusions about the effect of face masks on communication. None of the nine reviewed studies used the NQCPQ instrument that I intend to use in this study to measure the quality of communication. Furthermore, none of the nine reviewed studies reported the reliability of the instruments the authors used in collecting data.

Telehealth and the Quality of Communication in Healthcare Settings

Telehealth is a form of e-health that involves using telecommunications technology to provide healthcare services (Gajarawala & Pelkowski, 2021). Telemedicine uses telecommunications technology to offer clinical healthcare services remotely (Gu et al., 2021). The terms telehealth and telemedicine are, therefore, often used interchangeably (Gajarawala & Pelkowski, 2021). A number of studies have been conducted to examine the relationship between telehealth and the quality of communication in healthcare settings (e.g., Barbosa & Silva, 2017; Bashir & Bastola, 2018; Breton et al., 2021; Boström et al., 2020; Campbell & Goldstein, 2022; Garnett et

al., 2022; Kludacz-Alessandri et al., 2021; Kord et al., 2021; Weaver et al., 2020; Wu & Street, 2020).

Barbosa and Silva (2017), Kord et al. (2021), Boström et al. (2020), Breton et al. (2021), and Weaver et al. (2020) conducted qualitative studies pertaining to telehealth and communication in healthcare settings. In the first qualitative study, Barbosa and Silva (2017) used a descriptive design to evaluate nurses' perceptions of interpersonal communication while providing patient care via telehealth. The concepts addressed in this study were nurse-patient relations, telemedicine, health communication, distance consultation, and telenursing. The 20 participants included seven nurses and 13 doctors working in telehealth in Brazil. Whereas the researchers had obtained 24 acceptances, their sample size of 20 was determined since data saturation was reached by the twentieth interview, at which point the interviews were concluded. The authors used a self-developed open-ended questionnaire to interview the respondents and then conducted a thematic analysis. Four themes emerged, understanding the importance of communication, communicating via technology, interpersonal relationship interfering with communication, and learning the communication process. The findings indicated that nurses working in telehealth in Brazil perceived that technology has facilitated their professional practice. However, the nurses believe telehealth has made communication harder because of difficulty perceiving nonverbal signals.

In another descriptive phenomenological research, Kord et al. (2021) explored the experiences of COVID-19 patients who were given home care via telenursing. Communication was one of the major concepts addressed in this study, as the authors

extracted from patients' responses that communication was a serious and important matter pertaining to gaining access to remote care (Kord et al., 2021). The study's 20 participants were COVID-19 patients who had been discharged from the hospital and continued their care at home via telenursing. The participants were recruited using the purposive sampling method, and data was collected through semi-structured interviews using self-developed open-ended questions. The interviews were via telephone and Skype. One of this qualitative study's findings was that telehealth enabled patients to communicate more easily with their nurses. This finding however contracts Barbosa and Silva (2017) finding that nurses reported difficulty to communicate with patients when using face masks, citing difficulty in perceiving nonverbal signals. Patients believe that through telenursing, nurses have more time to dedicate to their patients (Kord et al., 2021).

Similarly, Boström et al. (2020) conducted a qualitative interview study where they explored the experiences of registered nurses (RNs) in practicing person-centered care (PCC) via telephone with patients that have been diagnosed with chronic obstructive pulmonary disease or chronic heart failure (CHF). The major concepts addressed in this study were telehealth, person-centered care, and RNs' professional roles. The authors developed and used semi-structured interviews to collect data. The study had four respondents who were all female RNs from a hospital in Sweden and were recruited by convenience sampling. The respondents were individually interviewed before, during, and after participation in an intervention practicing person-centered care via telephone. The study found that telehealth affected the RNs by remolding their professional role -

changing their thinking about their roles, which informed how they interacted with patients at a distance. By implying that RNs would have to listen more carefully and communicate as equal partners to their patients to meet both parties' concerns, Boström et al.'s findings reaffirm Barbosa and Silva (2017)'s findings.

Following the COVID-19 pandemic's drive for primary healthcare providers to use telehealth methods in place of traditional face-to-face consultations, Breton et al. (2021) conducted a comparative qualitative study to describe the positive and negative implications of using telehealth in two settings: a Canadian (Quebec) setting and a United States (Massachusetts) PHC setting in the course of the COVID-19 pandemic as reported by physicians. Data used in the study was collected using semi-structured interviews developed by the authors. The major concepts addressed in this study were physicians' practice history, changes as a result of the COVID-19 pandemic, and the merits and challenges of telehealth. A thematic analysis was then done to identify the implications of offering telehealth care services. The four key themes identified in the study were: access for patients, professional impacts, the efficiency of care delivery, and relational dimensions of care. Communication was an integral part of these four themes. Regarding communication, the authors found that the positive implications of telehealth were improved follow-up care, flexibility, and improved communication because patients were more at ease at home. On the other hand, the negative implications involved difficulties in diagnosing patients without nonverbal cues and direct physical examination.

Similarly, Weaver et al. (2020) conducted a qualitative interview study to explore the experiences of nurses caring for children at the end of life using telehealth modalities

to inform palliative communication. Data was collected using qualitative interviews that the researchers developed. Communication was one of the main themes and concepts addressed in the study. The 15 participants of the study were nurses from nine hospice agencies in the United States. Under the theme of communication, the authors found that telehealth enables timely communication between children and nurses who use telehealth to care for children receiving end-of-life care. This backs up Kord et al. (2021)'s finding that telenursing facilitates better nursing care for patients.

Bashir and Bastola (2018), Campbell and Goldstein (2022), and Garnett et al. (2022) conducted mixed methods studies concerning telehealth and communication in healthcare. Bashir and Bastola examined whether telehealth technology affects nurses' perceived level of internal service quality. The authors used the Service Quality (SERVQUAL) instrument to measure service quality but did not report the instrument's reliability. The main concepts addressed by the authors in this study were telehealth, telenursing, and quality of service delivery. The quantitative portion of the study investigated two variables: expectations of telehealth nursing service quality and perceptions of telehealth nursing service quality. The study's 13 respondents were the telehealth nursing staff of the Visiting Nurse Association of Omaha, a telehealth organization. The respondents were recruited using the convenience sampling method, and data were collected using interview questions and Survey Monkey, a web-based software tool. Closely related to the findings of Kord et al. (2021) and Weaver et al. (2020), this study revealed that telehealth positively affects nurses' perceived level of

internal service quality by improving communication between patients, healthcare providers, and caregivers.

Additionally, Campbell and Goldstein (2022) examined the evolution in the technology, connectivity, implementation of services, and attitudes of pediatric speech-language pathology clinicians using synchronous videoconferencing following the outbreak of the COVID-19 pandemic. The study's variables were telehealth technology and barriers to care; telehealth and pediatric speech-language were the main concepts addressed in this study. In the qualitative portion of the study, the authors identified three main themes: advantages, disadvantages, and the future of telehealth. The study's 259 participants included speech-language clinicians from different countries. The participants were recruited using the convenience sampling method using various social media sites. Campbell and Goldstein et al. developed their Pediatric Provider Survey questionnaire and adjusted it to suit their study and setting. The study found that whereas clinicians reported many advantages of telehealth, the ability of some children to engage in telehealth services was limited following persistent barriers such as access to technology, limited connectivity, access to technology, and families' comfort level with using telehealth services. This data implies a negative effect of telehealth on the communication between clinicians and children. The authors also noted clinicians' concern about conducting studies comparing remote and face-to-face service delivery (Campbell & Goldstein, 2022). These findings resonate with Barbosa and Silva (2017) and Boström et al. (2020)'s findings.

Another mixed methods design study was conducted by Garnett et al. (2022), who used a convergent approach to investigate parent perceptions of a group tele-practice communication intervention for autism to understand the parents' intervention preferences. Telehealth, communication, parent training, and satisfaction were the main concepts addressed in the qualitative portion of this study. The variables addressed in the quantitative portion of the study were total stress, child domain, and a parent domain. The study's 11 participants were parents of preschool children with autism who were part and parcel of a tele-practice delivered group training program called Hanen More Than Words (HMTW) in Australia. Data was collected using the Parenting Stress Index, HMTW program evaluation forms, and an online parent survey. The intervention teaches strategies to improve social-communication development in young children. The respondents were recruited using the convenience sampling method, where they volunteered to participate in the study. The study found that parents reported high satisfaction levels with tele-practice delivered HMTW, as perceived improvements in their children's communication, interaction, responsiveness, and play.

Kludacz-Alessandri et al. (2021) and Wu & Street (2020) conducted quantitative studies pertaining to telehealth and communication in healthcare. Kludacz-Alessandri et al. (2021) used their correlational study to examine patients' satisfaction with teleconsultation in primary care and the effect of teleconsultations on communication between patients and General Practitioners (GPs). The key variables in this study were interpersonal communication, respect, technical quality, and behavioral quality. Kludacz-Alessandri et al. (2021) developed their questionnaire based on the literature and

adjusted it to suit their study and setting. The instrument's reliability was measured using Cronbach's alpha coefficient and found to have high reliability ($\alpha = 0.88$). The study's 105 participants were over 18 years old people that were randomly selected from the database of a clinic in Poland. Kludacz-Alessandri et al. (2021) did not identify the use of any theoretical framework in their study. The authors found out that the quality of teleconsultations is not inferior to the quality of consultation during a face-to-face visit. The research also showed that patients experienced a high level of satisfaction regarding their communication with a general practitioner during teleconsultation (Kludacz-Alessandri et al., 2021). Furthermore, the findings indicated that the technical quality and the sense of comfort during teleconsultation positively affect the quality of communication between patients and general practitioners. These findings mirror the findings of Bashir and Bastola (2018), Garnett et al. (2022), Kord et al. (2021), and Weaver et al. (2020).

Like Kludacz-Alessandri et al. (2021), Wu & Street (2020) conducted a quantitative correlational study to explore personal, clinical, and technology factors that predict cancer survivors' electronic communication with clinicians. The authors used the 2018 Health Information Trends Survey data, a nationally representative mail survey that was conducted in the United States from January to May 2018. The survey had 593 respondents, all of whom had been diagnosed with cancer. Wu & Street (2020) used the Patient-Centered Communication theoretical framework to ground their creation of the instrument they used to measure patient-centered communication in their study. The authors assessed the instrument's reliability using Cronbach's alpha and found it to have

high reliability ($\alpha = .924$). The main variables used in the study were online health information, electronic communication, cancer history, patient-centered communication, and the frequency of visiting a healthcare provider. The study found that experience and exposure to interactive media technologies strongly predict cancer patients' electronic communication with clinicians. These findings suggest that the relationship between telehealth technology and communication depends on the patients' digital competence or experience with electronic communication (Wu & Street, 2020). Unlike other reviewed studies in this section (e.g., Barbosa & Silva, 2017; Bashir & Bastola, 2018; Breton et al., 2021; Boström et al., 2020; Campbell & Goldstein, 2022; Garnett et al., 2022; Kludacz-Alessandri et al., 2021; Kord et al., 2021; Weaver et al., 2020), this study did not focus on the overall relationship between telehealth and communication.

There are a number of similarities and differences in the studies that were reviewed in this section. Five (Bashir & Bastola, 2018; Barbosa & Silva, 2017; Boström et al., 2020; Kord et al., 2021; Weaver et al., 2020) of the studies reviewed included nurses. All but two (Barbosa & Silva, 2017; Boström et al. (2020) concluded that telehealth improved communication between nurses and patients. One probable reason why Barbosa & Silva (2017) and Boström et al. (2020) found that nurses perceived communication using telehealth to be more complex is the fact that their studies used a small sample size of 20 and four respondents, respectively. Thus, the perceptions of these nurses may not have been representative of the nursing fraternity. Four additional studies focused on patients (e.g., Campbell & Goldstein, 2022; Garnett et al., 2022; Kludacz-

Alessandri et al., 2021; Wu & Street, 2020) also reported that telehealth positively affects the communication between healthcare providers and patients.

Strengths and Weaknesses

The main strength of the reviewed studies is that nurses were represented in five of the ten reviewed studies (e.g., Barbosa & Silva, 2017; Bashir & Bastola, 2018; Boström et al., 2020; Kord et al., 2021; Weaver et al., 2020). The reviewed quantitative studies used instruments with high reliability based on Cronbach's alpha. Weaknesses include using qualitative methods with small sample sizes and the inability to generalize the findings beyond the specific population studied. Most of the reviewed literature in this section was from qualitative studies (e.g., Barbosa and Silva, 2017; Kord et al., 2021; Boström et al., 2020; Breton et al., 2021; Weaver et al., 2020). This data is because relatively fewer quantitative researches have been conducted on telehealth and communication in healthcare settings. Only two of the studies reviewed in this section were purely quantitative studies (Kludacz-Alessandri et al., 2021; Wu & Street, 2020), and only one of these quantitative studies identified a theoretical framework (Kludacz-Alessandri et al., 2021). There was also a variation in how the different reviewed studies measured the quality of communication. All ten reviewed studies used different instruments, with nine of them having been developed by the studies' authors based on different parameters. This data makes it difficult to compare the findings across studies and make consistent conclusions about the effect of telehealth on communication. Lastly, none of the reviewed studies used the NQCPQ instrument that I intend to use in this study to measure the quality of communication.

Summary and Conclusions

This literature review has covered studies on nurse-patient communication and the effects of face masks and telehealth devices on communication in healthcare settings. I have reviewed 26 studies; 17 quantitative, four mixed (qualitative and quantitative) designs, and five qualitative studies. Based on this review and synthesis of studies, communication is a crucial component of healthcare service provision and significantly affects patient outcomes. Effective communication will lead to relatively desirable patient outcomes, such as patient satisfaction and compliance, while faulty communication will result in relatively undesirable patient outcomes. It has also been shown that face masks and telehealth significantly affect the quality of communication between patients and health care providers negatively and positively.

Based on this literature review, I have identified a number of weaknesses that I will improve upon with my study. Only seven out of the 26 reviewed studies focused on nurses, while only 13 studies included patients. There is thus a need to conduct more research on the nurse-patient quality of communication using both nurses and patients as participants. Eleven of the 17 quantitative studies that were reviewed did not identify the use of theoretical frameworks to guide their selection of variables, identify their research questions or ground the studies. Furthermore, none of the reviewed studies used LCT or MTC. I will use these two theories and advance knowledge in literature based on LCT and MTC. Since only 11 of the 26 reviewed studies were done in hospitals, there is a need to conduct more research on nurse-patient communication in a hospital setting, and I will do that in my study. All 17 quantitative studies were correlational; and of these 17,

only seven were reported to have used reliable data collection instruments. I have chosen to use the NQCPQ instrument to measure the quality of nurse-patient communication in this study. This decision is because, unlike other instruments at my disposal, the NQCPQ is explicitly aimed at nurse-patient communication. NQCPQ has also been shown to have high reliability from two reviewed studies that used this data collection instrument.

I have also identified some strengths I will build upon in my study. Seventeen out of the 26 reviewed studies were quantitative, most of which used relatively large sample sizes. My study will be quantitative, and I will ensure to use more than the required minimum sample size based on a power analysis.

Despite the focus of the reviewed literature on analyzing the effects of facemasks and telehealth on the quality of communication, none of these studies compares telehealth versus N95 masks infection control measures as physical barriers to nurse-patient communication. There is a need to conduct studies that compare remote and face-to-face healthcare service delivery (Campbell & Goldstein, 2022). This study will examine the quality of communication when using N95 masks versus telehealth devices in a hospital setting and provide knowledge on the gap in the current literature in that no studies have been done to compare the effects of telehealth versus face masks on communication between nurses and patients.

Chapter 3: Research Method

Introduction

This quantitative cross-sectional study compared and described how face masks and telehealth devices affected the quality of communication between nurses and patients in a hospital setting. This chapter contains details on the research design and rationale, methodology (population sampling procedures), recruitment participation, and data collection. My study further described the instrumentation and operationalization of constructs and the study's data analysis plan. Lastly, I addressed ethical validity procedures' threats and concluded with a summary section.

Research Design and Rationale

My study was quantitative, with a cross-sectional comparative research design. The independent variables for this study were face masks and telehealth devices. The dependent variable was the nurse's perception of the quality of communication, a scale variable between the nurse and the patient. I assessed the nurses' perceived quality of communication when face masks were used and when a telehealth device was used to maintain infection control.

I used a quantitative approach because it examined the relationship between the use of face masks and telehealth to the perceived quality of communication. The differences in nurses' perceived quality of communication with patients when nurses used face masks versus telehealth were examined. The data were collected only once, making the cross-sectional research design the best fit to employ. According to Creswell and Creswell (2018), a cross-sectional design involves a survey collecting data at one

given point instead of overtime. I collected data on the exposure and outcome in one-time measurements, which saved time and resources for data collection as the design is relatively fast and inexpensive. However, because the data for the independent and dependent variables are collected simultaneously, cross-sectional designs cannot be used to derive causal relationships (Setia, 2016).

Methodology

Population

The target population for this study was registered nurses (RNs) employed in a nonprofit community-based hospital in the United States and who attended to patients using either face masks or telehealth devices. The size of the target population was 179 RNs.

Sampling and Sampling Procedures

I used convenience sampling because participation in the study was voluntary. Convenience sampling is a nonprobability sampling method whereby respondents are accessible to a researcher and voluntarily elect to participate in the study (Lavrakas, 2008).

The IRB approval number for this study is 11-18-22-1020593. I initiated recruiting potential participants via email. An email containing a link to the survey was sent to RNs. They needed to click on it if they were interested in participating in the survey. When they clicked on the link, the screening questionnaire opened; if they qualified then the consent page opened. Those who qualified for the study were then requested to read the consent form. My consent statements informed potential

participants that proceeding with the online survey would imply that they were giving consent to participate in the study. If they consented to participate, the survey opened and they were able to respond to the demographic questions and then do the survey. Those that did not qualify for the study based on their responses to the screening questionnaire were excluded, the survey closed, and they were redirected to a page thanking them for their willingness to participate. The survey also closed for those who chose not to consent to the study. Potential participants for this study were hospital-based staff RNs who routinely used face masks or telehealth devices when attending to their patients. All RNs who did not routinely perform direct patient care were excluded from the study. Travel nurses, nurses in administrative roles, and nurses who did not provide direct patient care in outpatient areas were excluded.

I used the G*Power software (3.1.9.7 version; Heinrich Heine Universitat Dusseldorf, 2020) to conduct the a priori power analysis to determine the minimum sample size for the study. The power analysis included 80% statistical power ($1 - \beta = 0.8$), 95% confidence interval ($\alpha = 0.05$), and medium effect size of 0.5. The minimum sample size returned following the power analysis: 64 respondents per group, thus arriving at a total sample size of 128. The statistical power of 80% was chosen because it guarantees a high chance (80% chance) of deriving statistically significant findings if the null hypothesis ought to be rejected (Gray et al., 2017). The α of 0.05 was selected to ensure the study would have a high degree of precision (Creswell & Creswell, 2018). According to Schäfer and Schwarz (2019), a medium effect size is acceptable in

exhibiting the meaningfulness of a research study's findings, thus justifying the use of a medium effect size (0.5) for conducting independent samples t test.

Procedures for Recruitment, Participation, and Data Collection

For this study, I emailed the recruitment script (Appendix A) to RNs in the hospital who were screened for the inclusion criteria after clicking on the link to the survey. The screening questionnaire (Appendix B) then opened. Those that did not meet the study criteria were excluded, the survey closed, and they were redirected to a page thanking them for their willingness to participate. Those that qualified for the study were directed to the survey. The use of email for recruitment was convenient for the respondents as they could complete the survey whenever they were available or in their free time. The request for participation was sent together with the link to the survey to the RNs every day for one week. Each RN was allowed to participate in the survey multiple times but only once per day. Participants answered the survey based on their experiences with the last patient they cared for that day. My sample size was therefore based on the number of surveys completed, as opposed to the number of individual nurses that completed the surveys. I used this method to obtain fresh information on the RNs' minds while also helping reach the minimum required sample size for the study.

Participants Informed Consent

Before beginning the survey, participants read the consent form. The consent form included the purpose of the study and the procedures involved in participating in the study. It also stated that participation was voluntary, and thus it was one's decision whether to join or not. The informed consent also included clarification that one was still

be free to change their mind later even if they had agreed to participate in the study and that they could exit the survey at any stage. The informed consent form included information about the risks and benefits of participating in the survey and also guaranteed the protection of participants' privacy and confidentiality.

My consent form statements explained to the potential participant that their consent would be implied click on the 'Proceed to study' button in the consent form. Once respondents completed the survey, a note thanking them for their participation opened.

Demographic Information

My study collected demographic information similar to that collected by other studies related to this topic (e.g., Junaid & Rafi, 2021; Kludacz-Alessandri et al., 2021; Vitale et al., 2021). Thus, the following demographic variables were to describe the sample:

- Gender (Man, Woman, Transgender, Non-Binary, Other, Prefer not to say).
- Age (18 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55+ years).
- Duration of practice as an RN (0 to 6 months, 7 to 12 months, 1 to 2 years, and more than 2 years).
- Highest education qualification (associate degree, bachelor's degree, master's degree or higher).

By collecting this information, I ascertained this study's participants were similar or different from previous studies, which is essential to interpreting the findings. In order to collect only one demographic questionnaire from each individual participant and avoid

overrepresentation of the demographic characteristics of the sample, the first question on the demographic survey, I asked the participant whether they had responded to the survey on a previous day. Those that answered “no” continued with the demographic survey, those that answered “yes” were automatically be redirected to the NQCPQ. The demographic survey can be found in Appendix D.

Participants Exit and Follow Up

There were several avenues for participants to exit the study at their will. Participation was voluntary; those not willing to participate in the study had the free choice of not participating. A participant could opt not to respond were not coerced to complete the survey. Participants informed consent was ensured before taking the survey. Anyone who was did not consent at that point was free to exit the survey. Even after beginning the survey, participants still had the ability to answer all, some, or none of the questions. Participants could stop answering questions and exit the survey any time they wished. Those who completed the survey will receive a thank you note at the end. The cross-sectional nature of this study did not require follow-up with the participants upon completing the survey.

Instrumentation and Operationalization of Constructs

My study used the Nurse Quality of Communication with Patient Questionnaire (NQCPQ), a six-item instrument. This instrument was developed by authors Mira Vuković et al. (2010). Permission to adopt the NQCPQ was received on February 06, 2022 (Appendix C). The NQCPQ instrument was appropriate for the study because this study focused on the quality of communication between nurses and patients. The six-item

instrument measures the quality of nurse-patient communication in a reliable, fast, and straightforward way. Its items are scored on a Likert (ordinal) scale from 1 to 6, with 1 depicting the minor quality of communication and 6 representing the highest (excellent) quality of communication (Vuković et al., 2010). For each respondent, scores of the instrument were summed to get the overall score per respondent. The overall score could therefore have a possible range of 6 to 36.

Construct validity of the NQCPQ instrument evaluated by analyzing the main components. The six items were found to explain 86% of the variability in the quality of nurse-patient communication, hence concluding that the instrument has a high construct validity (Vuković et al., 2010). The internal consistency reliability of the instrument using Cronbach's alpha coefficient is 0.97 (Vuković et al., 2010).

Previous Application of the NQCPQ

The NQCPQ instrument had been used in the data collection process of several studies, and the reliability scores have proved to be remarkably consistent. Nikmanesh et al. (2018) used NQCPQ to investigate the effect of nurses' communication skills training on patients' satisfaction with nurses in teaching hospitals affiliated with a university in Iran. The reliability of NQCPQ was assessed and found to have a Cronbach's alpha of 0.87 (Nikmanesh et al., 2018). In a correlational study, Avestan et al. (2019) used NQCPQ to determine cancer patients' perceptions of respecting their dignity and the correlation between their perceptions and nurse-patient communication settings of a hospital. They piloted the instrument on 30 patients. The instrument's Cronbach's alpha was computed and calculated as 0.96, which is highly acceptable. Lotfi et al. (2019) also

used the instrument in a study to assess patient satisfaction with nurse-patient communication at a hospital. However, the authors did not report any information on the validity and reliability of the instrument.

Operational Definitions

This study had three main variables: the independent variables were N95 masks and the use of telehealth devices. The dependent variable was the perceived quality of communication between nurses and patients.

Use of N95 Masks

This independent variable was measured on a nominal scale of the measurement variable; this was referred to as Group 1.

Use of Telehealth Devices

The use of telehealth devices was measured on a nominal variable. The option on this scale involved RNs who used telehealth devices to communicate with patients; this was referred to as Group 2.

Quality of Nurse-Patient Communication

Quality of communication between a nurse and a patient is a measure of the perception the nurse has of the quality of spoken and nonverbal contact with the patient while going about their professional role, and based on the patient's rejection or acceptance of their condition, appropriate nursing care and pharmacotherapy in the course of their hospitalization (Vuković et al., 2010). This variable was the dependent variable for the study, and it was measured on an interval scale of measurement.

Data Analysis Plan

The Statistical Package for Social Sciences (SPSS) version 28 used for data analysis in this study. Upon the collection period, responses to the online Survey Monkey survey were downloaded into a password-protected computer and transferred to the SPSS software package.

Data Cleaning and Screening

Data cleaning and screening were to ensure the accuracy of the collected data and the validity of the analysis. According to Merter and Reinhart (2017) assert that by using data screening procedure ensured checking for univariate outliers and missing data values. Incomplete records and outliers were deleted from the sample.

Research Questions (RQs) and Hypotheses

RQ1: What is the relationship between the use of N95 masks and the perceived quality of communication between nurses and patients?

H_01 : There is no significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

H_11 : There is a significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

RQ2: What is the relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients?

H_02 : There is no significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

H_{12} : There is a significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

RQ3: Is there a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients?

H_{03} : There is no statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

H_{13} : There is a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

Statistical Tests

A sample description was provided based on the demographics collected from participants. Several statistical tests were conducted to test the null and alternative hypotheses for the study. For all tests conducted to address the research questions, the underlying assumptions of the tests were examined, and descriptive statistics generated and interpreted to summarize variable data. Descriptive statistics included measures of central tendency (mean, mode median), dispersion (standard deviation, minimum and maximum values), and frequency distributions (Warner, 2013). Reliability in statistics refers to the ability of a measure to yield consistent results (Amirrudin et al., 2020). This study will ensure the reliability of the NQCPQ by examining the internal consistency reliability of the instrument using Cronbach's alpha. Below, I describe the statistical

procedures used to answer each research question and how the underlying assumptions of each test were assessed.

Pearson Product-Moment Correlation Coefficient

Point-biserial Pearson correlations was used to address RQ1 and RQ2. A point-biserial Pearson's correlation coefficient (denoted by r_{pb}) is a statistical test used to assess the association between two variables, one that is dichotomous and one that is continuous (Warner, 2013). Pearson correlation shows the presence or absence of a significant association and the magnitude and direction of the relationship where it exists.

The Pearson correlation coefficient (r_{pb})'s values range from -1 to +1. A value of 0 means total absence of association, while a value of 1 signifies perfect association of the two variables. Positive values of r_{pb} indicate a direct relationship, while negative values tell an inverse relationship. When the value of r_{pb} is between ± 0.80 and ± 1 , the association is said to be strong. A range of ± 0.40 and ± 0.79 implies a fair to medium correlation, while r_{pb} values between ± 0.20 and ± 0.39 signify a weak correlation. r_{pb} values less than ± 0.19 are interpreted to have a negligible association (Chao, 2017).

Below are the underlying assumptions of point-biserial Pearson correlations and how adherence to each hypothesis will be examined in this study (Sheshkin, 2011; Warner, 2013).

1. The continuous variable should have no outliers within each category of the dichotomous variable. Box plots for each group will be examined, and any cases identified as outliers will be removed.

2. The continuous variable should have an approximately normal distribution within each category of the dichotomous variable. Histograms and the Kolmogorov Smirnov test for normality will be generated and used to assess the distribution of the dependent variable (quality of communication) for each group. A significant p -value on the Kolmogorov Smirnov test indicates that the data is not normally distributed. If the data is not normally distributed, transformations will be conducted according to the formulas found (Mertler & Reinhart, 2017).
3. The continuous variable should have equal variances within each category of the dichotomous. An error bar chart will be used to check this assumption. If the breadth of the error bars is found to be approximately the same between the groups, then equal variances will be assumed (IBM Corporation, 2021).

Independent Samples T test

An independent samples t -test was used for RQ3. The independent sample t -test is a statistical procedure used to compare the means of two independent groups and ascertain whether or not there is a significant difference between the means for each group (Gerald, 2018; Warner, 2013). Based on sample data, researchers make claims about populations under study and run t -tests on the data to make inferences about the populations being investigated (Burrell & Gross, 2017). The statistical procedure compared the quality of communication between two independent groups; nurses who use telehealth devices and face masks. The use of telehealth devices and face masks, both nominal variables, were the independent variables. The dependent variable was the

quality of communication, a numerical variable. A p -value of less than .05 would indicate a significant difference between the mean quality of communication scores of those who used N95 masks compared to those who used telehealth communication in caring for patients. Before conducting the independent samples t -test, I examined the data for the following underlying assumptions:

1. The dependent variable should have an approximately normal distribution within each category of the independent variable. Histograms and the Kolmogorov Smirnov test for normality will be generated and used to assess the distribution of the dependent variable (quality of communication) for each group. A significant p -value on the Kolmogorov Smirnov test indicates that the data is not normally distributed. If the data is not normally distributed, transformations would be conducted according to the formulas (Mertler & Reinhart, 2017).
2. The dependent variable should have equal variances within each category of the independent variable. Levene's test of homogeneity of variances was used to check for violations of this assumption (Parra-Frutos, 2016). Levene's test assesses the null hypothesis that there is an equal variance of the dependent variable within each subgroup of the dependent variable. A p -value of less than 0.05 would warrant the rejection of the null hypothesis. For a group to meet this assumption, the p -value should be greater than the alpha value (α).

Threats to Validity

Validity is how researchers can be assured of the correctness of the results obtained (Polit & Beck, 2012). Researchers attempt to address a number of threats to

validity to ensure that the study's findings are attributed to the explanatory variables rather than any other exogenous factors. This study addressed the following threats to validity: external validity, internal validity, and construct validity.

External Validity

External validity is how a given study's results are generalizable to real-life situations, people, measures, or settings in daily practice, particularly for the population which ought to be represented by the sample (Patino & Ferreira, 2018). Therefore, threats to external validity are those factors that would decrease the result's generalizability (Warner, 2013). External validity threats can also occur if a researcher derives incorrect conclusions from research data about other settings, people, and past or future circumstances (Creswell & Creswell, 2018).

The threat to external validity for this study was related to the cross-sectional design of the study, technological changes, the COVID-19 outbreak, and the use of one study site. Since the study was conducted at one point in time, there was a threat that the findings do not reflect the position of the quality of communication during other periods. For example, the results of this study may not be generalizable if the use of telehealth devices in healthcare decreases dramatically post-pandemic (Smith et al., 2020). Further, the study took place at a single hospital and therefore the results may not be representative of the broader population of nurses throughout the U.S. and internationally.

Internal Validity

Internal validity refers to how a study's observed results establish the truth of the studied population parameters. An example is truth on a cause-and-effect relationship between independent variables and a given dependent variable in a study (Patino & Ferreira, 2018). Internal validity is related to treatments, experimental procedures, and respondents' experiences that threaten the researchers' ability to make inferences from data about a given population correctly studied (Creswell & Creswell, 2018). A cross-sectional design limits the ability to determine a cause and effect (Gray et al., 2017). Promoting generalizability, the NQCPQ survey instrument was used. Attrition was also a threat to the internal validity of this study. Since data was collected over seven days, there is a possibility that the nurses who continue to respond to the survey over the seven days were different, for instance, more motivated to respond than those who only answered once or twice. Statistical regression towards the mean is another potential threat to internal validity in the study. Regression towards the mean describes the tendency of data with extremely high or low values the first time it is collected to return to the average value the next time it is collected (Glen, 2014). The amount of regression towards the mean can be calculated by subtracting the value of r from 1 ($1 - r$). Factors contributing to regression towards the mean include sampling error and very small sample sizes. This study collected data over one week; therefore, some regression towards the mean was likely to occur.

Construct Validity

Construct validity refers to how a measure shows consistency with theoretical hypotheses (Strauss & Smith, 2009). Construct validity indicates how well the outcomes on the research instrument are expressive of the theoretical construct (Strauss & Smith, 2009). Construct validity was enhanced by using the NQCPQ survey instrument, which measures the nurse-patient quality of communication from the perspective of nurses. The survey tool has strong reliability and validity scores (Vuković et al., 2010). The survey tool is also in tandem with the two theories under which the study was grounded; Shannon's (1948) Mathematical Theory of Communication (MTC) and Lewin's change theory (LCM). Whereas the MTC focuses on communication and the mode used to send a message, LCM addresses the change factor that stems from the new widespread adoption of telehealth devices in response to the COVID-19 pandemic.

Ethical Procedures

Ensuring Access to the Data

A letter was sought from the authorities of the hospital where the study's data was collected to grant permission to allow data collection from the nursing staff at the facility. After being granted the approval, I sought permission from the IRB at Walden University regarding the hospital used to collect data for the study.

Treatment of Human Participants

Consent was required from each participant each time they responded to the survey. The consent contained all the necessary elements to make an informed decision

about participation (Appendix E). Only individuals who consented to participate in the study were allowed to proceed to the study survey and the data collection process.

A clear description of the research was provided so that potential participants would know what the study was all about. Respondents were also be informed about their roles as well as guided on the necessary procedures to undertake. An explanation of measures to ensure confidentiality, description of any potential risks and benefits of study and contact information was provided in case any participant had inquiries or concerns on the research. Participants were also be informed that participation was voluntary and that the participants were at liberty to unconditionally exit the study if they wished to do so.

Treatment of Data

The identity of the hospital where this study took place was masked. Research also protected the participants' privacy and minimized harm (Ravitch & Carl, 2016). Data confidentiality is a vital objective of the data management plan of this study. The data was anonymous such that no demographic information collected during the survey was linked to individual responses to the survey. Therefore, it was not be possible to tell which participant submitted which response. Participants would respond to the study survey once a day during the two-week study period, however their individual responses were not be tracked over time. Although some demographic information was collected, it did not include participant names, email addresses, IP addresses, or personal identifiable information. The data was only be accessible to me, and on an "as needed" bases to my committee during the data analysis phase.

Data Storage

Data was downloaded from SurveyMonkey to an electronic file on my laptop, protected using a password. For safety and precautionary measures during the study, the data was backed up on an external hard drive. After finishing the data collection exercise, the data collected was erased from SurveyMonkey using “remove all responses” in the Analyze Results section.

When not in use, the laptop and external hard was locked in a file cabinet for which only I have the key. The cabinet was placed in a well-secured room. After analyzing the data, I deleted it from the laptop and maintained a copy only on the external hard drive. The data on the external hard drive was kept in the locked file cabinet to remain there for about five years before being destroyed, as required by Walden University.

Other Ethical Issues

Use of NQCPQ Instrument

Permission was sought and granted from the author of the Nurse Quality of Communication with Patient Questionnaire (NQCPQ) (Appendix C).

Power Differentials

Gibson et al. (2014) state that organizational hierarchies and power are aspects of social institutions forming societal foundations. Power differentials can sometimes enhance or constrain the ability of people to make sound ethical decisions. Concerning power differentials and this study, I was not the participants’ boss, and none of the RNs who participated in the study were persuaded to do so. Furthermore, no incentives were

used to bring more participants on board. The potential participants of the study had the final decision to open the survey email and participate in the survey.

Other Ethical Issues

The Walden University IRB requires that the results of the study be shared with the study participants. I provided a Google drive link that would allow participants to download a brief 1 to 2-page summary of the study results. The link was provided in the consent form, instructing participants to jot down the link address if they wished to receive a summary of the study's findings.

Summary

The purpose of this quantitative cross-sectional study was to describe the relationship of methods aimed at maintaining social distancing between nurses and patients to nurse-patient communication and to compare differences in the quality of communication when using such methods within the hospital setting. The independent variables for this study were face masks and telehealth devices. The dependent variable was the nurses' perception of the quality of communication.

In this chapter, I detailed the quantitative cross-sectional research design and the rationale for its use in my study, the methods and procedures to be used including the convenience sampling, data collection using the NQCPQ, and analysis using point-biserial correlations and an independent samples *t*-test. Ethical considerations such as informed consent, and protection of participants' privacy and confidentiality were also described. In chapter 4, I will outline the data collection process, evaluate statistical

assumptions, and report the descriptive and inferential results from the various statistical tests that was used to answer the research questions.

Chapter 4: Results

Introduction

The purpose of this quantitative cross-sectional study described the relationship of methods aimed at maintaining social distancing with nurse-patient communication and compared differences in the quality of communication when such methods used within the hospital setting. Data were collected and analyzed. The research questions and hypotheses investigated in this study:

Research Questions

RQ1: What is the relationship between the use of N95 masks and the perceived quality of communication between nurses and patients?

H_01 : There is no significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

H_11 : There is a significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients.

RQ2: What is the relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients?

H_02 : There is no significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

H_12 : There is a significant relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients.

RQ3: Is there a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients?

H_03 : There is no statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

H_13 : There is a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients.

This chapter contains details on data collection, the data analysis results, and a summary section. Data collection, data analysis results, and the summary section is described in the next sections.

Data Collection

The data collected over a period of 2 weeks, after which the survey was closed by revoking the link to the survey in SurveyMonkey. During the 2-week period, I emailed a recruitment script with a link to the survey to RNs at the hospital. The RNs were screened for the inclusion criteria after clicking on the link to the survey. Those who met the study criteria and consented to the study took the survey. I followed the recruitment and data collection process as planned, and no discrepancies were noted in data collection from the plan presented in Chapter 3.

The target population for this study was registered nurses (RNs) employed in a nonprofit community-based hospital in the United States and who attended to patients

using either face masks or telehealth devices. The size of the target population was 179 RNs. The total number of unique individuals who responded to the NQCPQ survey was 144; this reflects a response rate of 80.45%. My study allowed individuals to respond to the survey multiple times, therefore the total sample size based on the number of responses received was 245. This surpassed my estimated minimum sample size, of 128 responses (at least 64 responses per group).

There was a total of 299 responses before the removal of the unqualified cases, those that refused to consent, and cases with missing data. Out of the 299 responses, 282 were qualified to participate in the study and 258 consented to the study. There were 13 cases of missing data where respondents only filled their demographics details but did not proceed to take the survey. I removed these cases from the dataset.

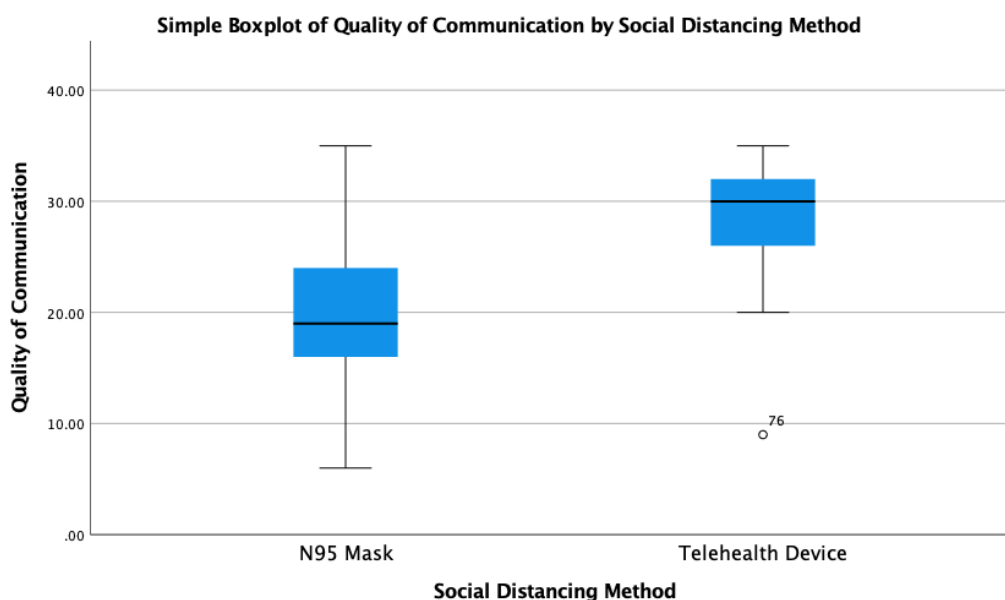
Outliers

Data cleaning and screening were done to ensure the accuracy of the collected data and the validity of the analysis. The data screening procedure involved checking for univariate outliers and missing data values. I deleted fifty-three incomplete records from the data. I examined box plots for each group to ascertain whether or not the dependent variable (quality of communication) had outliers within each category of the dichotomous variable (social distancing method). One outlier identified and removed to meet this assumption, thus leaving a new total of 244 responses (Figure 1). Therefore, the final number of responses were based on qualified participants who consented to participation after the removal of cases with missing data and who were outliers was 244; there were

145 (59.43%) who used N95 masks and 99 (40.57%) who used a telehealth device to communicate with patients.

Figure 1

Boxplots of the Quality of Communication Score by Social Distancing Method



Demographic Characteristics of the Sample

My study collected demographic information similar to that collected by other studies related to this topic. Table 1 is a frequency distribution table showing the distribution of the demographic characteristics of the final overall sample and according to group (N95, Telehealth) after the removal of one outlier ($N = 144$). The final sample consisted of mostly women (59.0%, $n = 85$), with a bachelor's degree (59.7%, $n = 86$), and at least 2 years of experiences (77.1%, $n = 111$). Regarding the age of the participants, the largest proportion consisted of people who were aged 55 years and above

(34.0%, $n = 49$). Noticeably, there was a higher proportion of men in the Telehealth group and a higher proportion of women in the N95 group.

Table 1

Demographic Characteristics of the Sample based on Unique Respondents and by Group (N=144).

		Sample	N95 ^a	Telehealth ^b
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Gender	Man	55 (38.2)	30 (30.9)	25 (53.2)
	Woman	85 (59.0)	63 (64.9)	22 (46.8)
	Transgender	3 (2.1)	3 (3.1)	0
	Other	1 (0.7)	1 (1.0)	0
Age in years	18-24 years	3 (2.1)	2 (2.1)	1 (2.1)
	25-34 years	36 (25.0)	27 (27.8)	9 (19.1)
	35-44 years	31 (21.5)	22 (22.7)	9 (19.1)
	45-54 years	25 (17.4)	12 (12.4)	13 (27.7)
	55 years and above	49 (34.0)	34 (35.1)	15 (31.9)
Duration of practice	0-6 Months	4 (2.8)	3 (3.1)	1 (2.1)
	7-11 Months	4 (2.8)	2 (2.1)	2 (4.3)
	1-2 Years	25 (17.4)	16 (16.5)	9 (19.1)
	More than 2 Years	111 (77.1)	76 (78.4)	35 (74.5)
Highest Education	Associate degree	52 (36.1)	34 (35.1)	18 (38.3)
	Bachelor's degree	86 (59.7)	58 (59.8)	28 (59.6)
	Master's degree or higher	6 (4.2%)	5 (5.2)	1 (2.1)

^a $n = 97$. ^b $n = 47$.

Descriptive Statistics

The overall mean of the Quality of Communication variable was 23.98 ($M = 23.98$, $SD = 7.00$), the median was 24 while the range was 29. Table 2 shows the descriptive statistics within each of the two groups.

Table 2*Descriptive Statistics on Quality of Communication by Group (N = 244)*

	N95 Masks ^a	Telehealth Devices ^b
Mean	20.19	29.52
Median	19.00	30.00
Std. Deviation	6.03	3.97
Range	29.00	15.00

^a*n* = 97. ^b*n* = 47.

Results

Underlying Assumptions of Point Biserial Correlation

I used point-biserial Pearson correlations to test the hypotheses for Research Questions 1 and 2. Before running the tests, the underlying assumptions of a point-biserial Pearson correlation test were examined which included the elimination of outliers, normality of the distribution, and equality of variances.

No outliers: This assumption was met following the removal of an outlier from the dataset. I removed the outlier for best results.

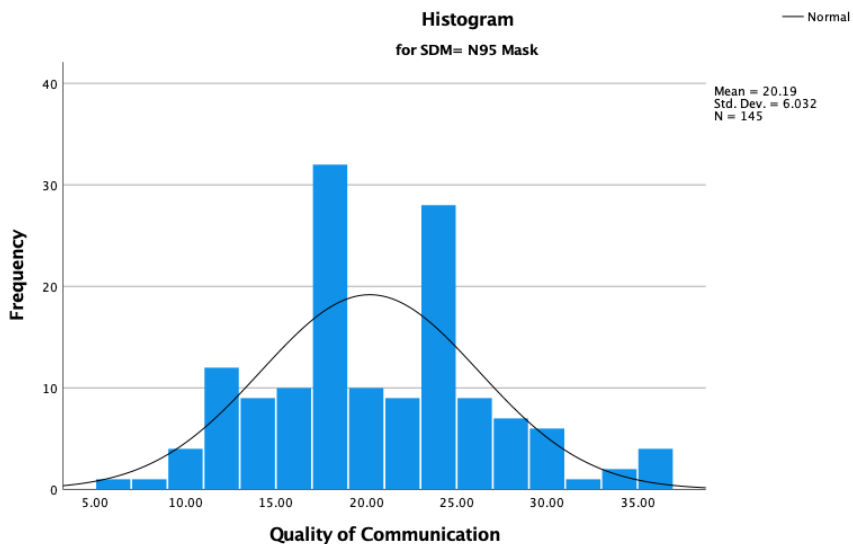
Normality: Histograms were generated to illustrate whether or not the dependent variable (quality of communication) had an approximately normal distribution within each category of the dichotomous variable (social distancing method). Figure 2 and Figure 3 provide visual results.

The histogram for N95 masks (Figure 2) was symmetrically shaped, thus indicating that the data was approximately normally distributed within this group. Further, the skewness of the quality of communication data for N95 masks was -.203,

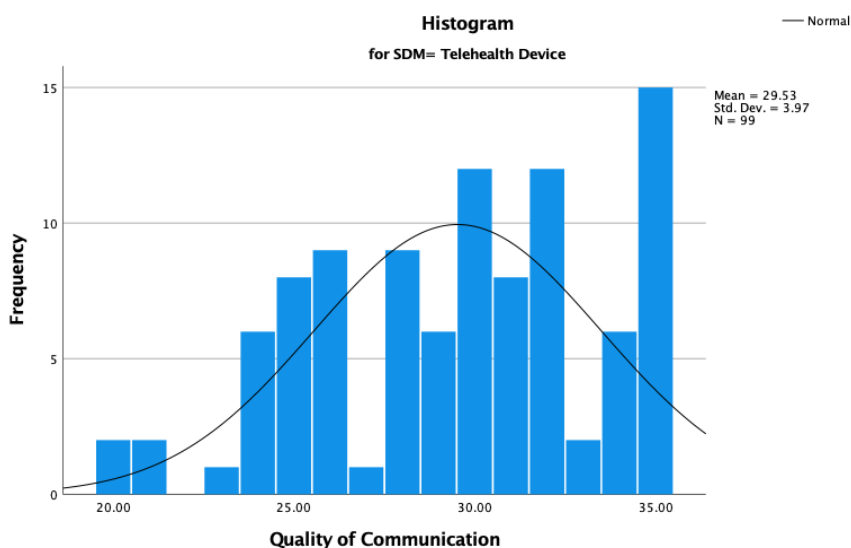
which is less than 2.0, therefore according to George and Mallery (2010) meeting the assumption of normality.

Figure 2

N95 Masks Histogram



The histogram for telehealth devices was not symmetrically shaped indicating that the data was negatively skewed (Figure 3). I attempted to correct the skew using square root and log 10 transformations, but the transformations did not improve the normality of the distribution.

Figure 3*Histogram for Telehealth Devices*

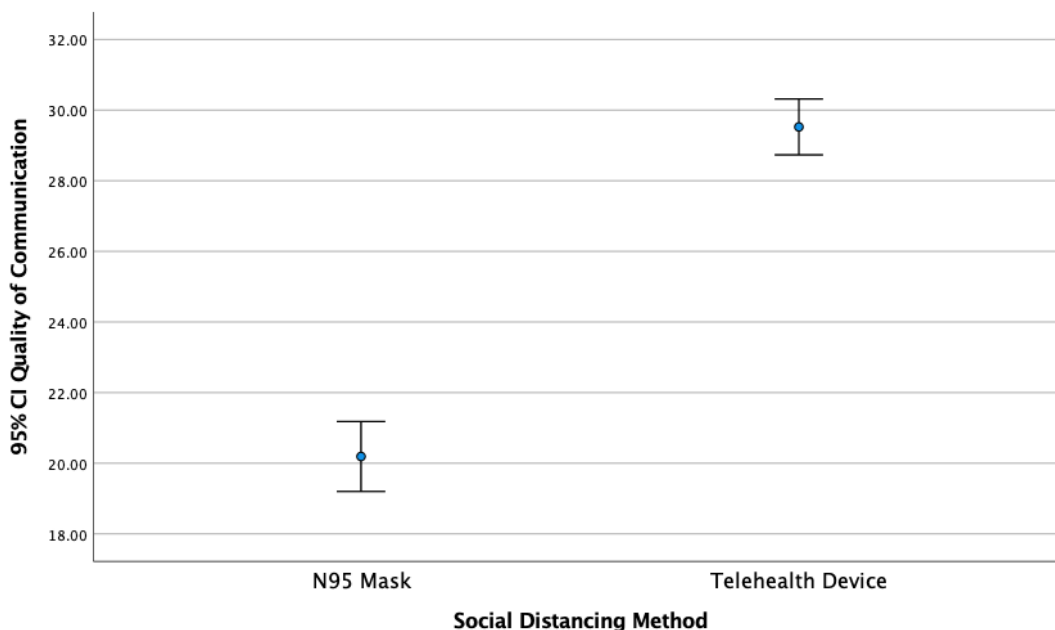
However, according to George and Mallery (2010), data with skewness ≤ 2.0 can be assumed to be normally distributed. Based on this, I ran the skewness statistics and found the skewness of the quality of communication to be -0.358 , which is less than 2.0 , therefore meeting the assumption of normality.

Equality of Variances

Visual inspection of error bars using the 95% confidence interval was used to assess the assumption of equality of variances (Figure 4). I discovered the breadth of the error bars to be approximately the same between the groups, and according to IBM Corporation (2021) indicating that equal variances could be assumed.

Figure 4

Social Distancing Method Error Bars (N = 244)



Analysis for Research Question 1

I conducted a point-biserial Pearson correlation test to examine the relationship between the use of N95 masks and the perceived quality of communication between nurses and patients. Use of N95 masks was coded as 1 in SPSS while the use of telehealth devices was coded as 0. The point-biserial Pearson correlation test revealed a significant moderate association between the use of N95 masks and the perceived quality of communication between nurses and patients ($r_{pb} = -.656, p < .001, n = 244$).

Therefore, I rejected the null hypotheses for RQ1 and concluded that there is a significant relationship between the use of N95 masks and the perceived quality of communication between nurses and patients. The null hypotheses for RQ1 is visually seen in Figure 2 and Figure 3.

Analysis for Research Question 2

A Point-biserial Pearson correlation test was conducted to examine the relationship between using a telehealth communication device and the perceived quality of communication between nurses and patients. Use of N95 masks was coded as 0 in SPSS while the use of telehealth devices was coded as 1. The Point-biserial Pearson correlation test revealed a significant positive association between the use of telehealth devices and the perceived quality of communication between nurses and patients ($r_{pb} = .656, p < .001, n = 244$).

Therefore, I rejected the null hypothesis for RQ2 and conclude that there is a significant relationship between using a telehealth device and the perceived quality of communication between nurses and patients. The null hypotheses for RQ1 is visually seen in Figure 2 and Figure 3.

Underlying Assumptions of Independent Samples T Test

An independent sample's t-test was used to address Research Question 3. Before running these tests, the underlying assumptions of the test were examined. The independent sample's t-test warrants the testing of normality and equality of variances.

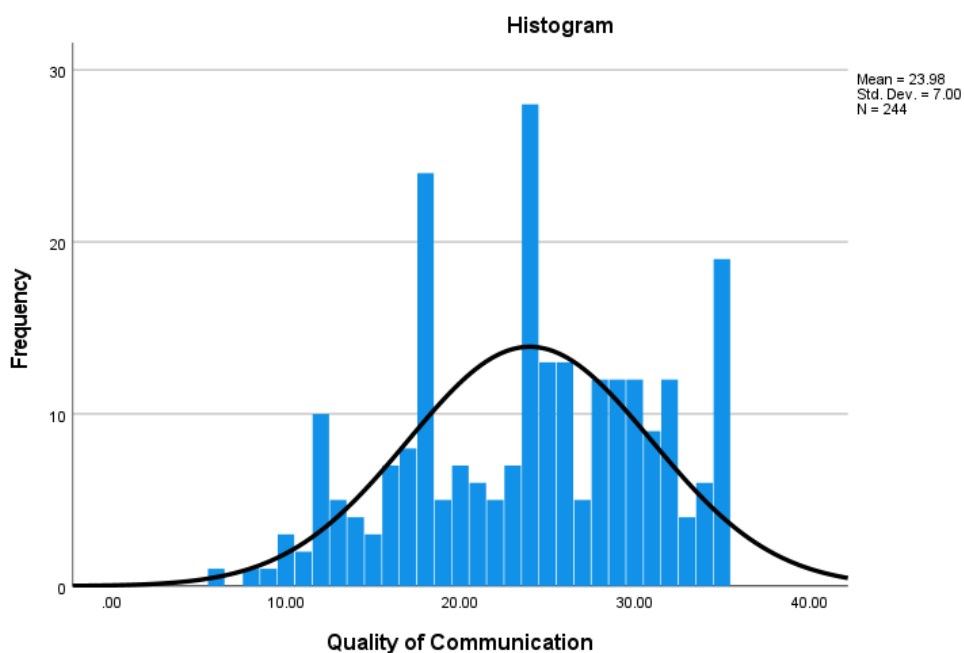
Normality

A histogram was drawn to illustrate whether or not the dependent variable (quality of communication) had an approximately normal distribution. The histogram for quality of communication was, however, not symmetrically shaped and it indicated that the data was negatively skewed (as shown in the figure below). I attempted to correct the

skew using Square-root and log transformation, but the transformations did not improve the normality of the distribution.

Figure 5

Quality of Communication Histogram



According to George and Mallery (2010), data with skewness ≤ 2.0 can be assumed to be normally distributed. Based on this, I ran the Skewness and Kurtosis statistics and found the skewness of the quality of communication to be $-.237$, which is less than 2.0, therefore meeting the assumption of normality.

Analysis for Research Question 3

To determine whether or not there was a statistically significant difference between the quality of nurse-patient communication when nurses use N95 masks versus when nurses use telehealth devices to communicate with the patients, an independent

sample t-test was conducted. The alpha level for significance was set at .05. The independent variable was social distancing method with two categories: N95 masks and telehealth devices. The dependent variable was the perceived quality of communication between nurses and patients, a continuous variable.

Although earlier visual inspection of the error bars had suggested equality of variances (Figure 4), the Levene's test for equality of the variances was significant ($p < .001$), meaning that equal variances could not be assumed for this analysis. I therefore interpreted the results from the 'Equal variances not assumed' row from the SPSS output table. The independent sample's t-test was significant ($t(242) = -14.57, p < .001$), revealing that nurses who used telehealth devices reported significantly higher ($M = 29.53, SD = 3.97$) quality of nurse-patient communication than their counterparts who used N95 masks ($M = 20.19, SD = 6.03$). The mean difference was -9.33 and the 95% confidence interval of the mean difference did not include zero: CI [-10.59, -8.07] confirming the significant difference between the groups. I therefore rejected the null hypothesis for RQ3 and concluded that there is a statistically significant difference in the quality of nurse-patient communication when nurses use N95 masks compared to when nurses use telehealth devices to communicate with the patients. When telehealth devices are used the quality of communication was judged to be considerably better than when N95 masks were used.

Summary

In this chapter, I presented the demographic characteristics of the sample, descriptive and inferential statistics for the research questions. The results of the analysis

supported the alternative hypotheses for all three research questions. A significant correlation was found between both N95 usage, telehealth device usage, and the quality of communication. There was also a significant difference in the quality of communication when N95 masks were used versus telehealth devices. In chapter 5, I will provide an interpretation of the findings, outline the limitations of the study, provide recommendations, and discuss the implications of the study's findings to positive social change and to practice.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative cross-sectional study described the relationship of methods aimed at maintaining social distancing between nurses and patients to nurse-patient communication and compared the differences in the quality of communication used within the hospital setting. My study was conducted to provide knowledge on the gap in the current literature in that no studies have been done to compare the effects of telehealth versus face masks on communication between nurses and patients. The study's independent variables were the two methods for social distancing methods (N95 mask or telehealth device), while the dependent variable was the quality of communication using the NQCPQ survey. I used convenience sampling of RNs in a hospital. The potential participants received a recruitment script that contained information about the study and a link to the survey.

The findings of the study indicated that there is a significant relationship between the use of N95 masks, the use of telehealth devices, and the quality of communication between nurses and patients. There was a moderate negative relationship between the use of N95 masks and the quality of communication, while there was a moderate positive relationship between the use of telehealth devices and the quality of communication. The findings also indicated that there was a significant difference between the quality of nurse-patient communication when nurses use N95 masks and when nurses use telehealth devices to communicate with the patients. Specifically, the quality of communication

between nurses and patients using telehealth devices was found to be significantly better than quality of communication between nurses and patients using N95 masks.

Interpretation of findings

The findings of this study indicated that the use of N95 masks was associated with nurses' perceptions of a lower quality of communication with patients. The finding was consistent with those findings of Bandaru et al. (2020) and Vitale et al. (2021) who studied nurses and other healthcare workers and found that the use of face masks, face shields, and other personal protective equipment was associated with a decrease in the quality of communication. Bandaru et al. (2020) explained that the decrease in communication was due to negative effects on speech perception and comprehension, and recommended the development of alternative communication strategies to ensure effective communication. The findings of this study are also consistent with the findings of Chu et al. (2021), Homans and Vroegop (2021), Langbehn et al. (2020), Rahne et al. (2021) and Ritter et al. (2022) who conducted studies that revealed that use of face masks impair the ability of healthcare workers to perceive speech and identify emotions in patients through nonverbal cues in their facial expressions.

The findings of this study indicate that the use of telehealth devices compared to the use of N95 masks was associated with a higher quality of communication between nurses and patients. Prior research has been inconsistent regarding the relationship of the use of telehealth devices to communication in healthcare settings with some finding benefits and others finding none. The findings of this study support those of prior studies Bashir and Bastola (2018), Boström et al., (2020), Kord et al. (2021), Kludacz-Alessandri

et al. (2020) and Weaver et al. (2020) found benefits to nurse-patient interactions with the use of telehealth devices in healthcare settings. I discovered some studies reported specific aspects of communication that were positively affected by the use of telehealth services or devices. Kord et al. (2021) and Weaver et al. (2020) found that nurses seemed to have more time to dedicate to their patients when using telenursing and that telehealth services enabled timely communication with patients. Boström et al. (2020) found that RNs perceived that the use of telehealth remolded how they interacted with patients at a distance by listening more carefully and communicating as equal partners their patients. However, none of the studies that I reviewed involved a quantitative comparison of two social distancing methods used for infection control. Thus, this study expands knowledge of the benefits of the use of telehealth devices by providing such a comparison. Specifically, I have found that the quality of communication between nurses and patients is significantly higher when using telehealth devices than when using N95 face masks in a hospital setting.

In contrast, the findings of earlier studies such as Barbosa and Silva (2017), Breton et al. (2021), and Campbell and Goldstein (2022) suggested that telehealth made communication with patients more difficult due to accessibility issues and the absence of nonverbal cues or difficulty in perceiving nonverbal signals that is inherent to some telehealth devices. My findings contradicted the findings of these authors because those studies were either focused on nonadult populations, conducted in different settings from my study such as primary care clinics, or they used telehealth devices that did not include video conferencing making it impossible to perceive nonverbal cues.

Theoretical Framework

The MTC and LCM were the theoretical frameworks that grounded this study. The MTC focuses on channels and barriers to communication and referred to the barriers that affect the process of communication as noise. The finding that the quality of communication is significantly higher with the use of telehealth devices compared to N95 masks indicates that there is a problem of understanding messages that are conveyed across the N95 masks. The noise of N95 masks as barriers distorts the quality of communication between nurses and patients. On the other hand, the use of telehealth devices as a medium for communication between nurses and patients does not degrade the quality of communication between nurses and patients.

The LCT provided a systematic three-step approach to illustrate the change process and helped explain the process of integrating nurses' use N95 masks and telehealth devices in hospital settings. The first stage (unfreezing) occurred when the mandatory use of social distancing was brought into play. The change stage is supposed to involve the development of new attitudes, values, and behavior in the new state of change (use of social distancing methods). The last stage, the refreeze stage, involves adapting and becoming familiar with the new practice. The findings of my study suggest that the change process has been smooth and there has been successful transition in the use of telehealth devices. However, the findings suggest that nurses are yet to successfully adapt to the use of N95 masks to an extent of facilitating quality communication between nurses and patients.

This study extends the knowledge in literature regarding the effects of N95 face masks and use of telehealth devices by using the two theoretical frameworks to navigate how the two infection control measures affect the quality of communication between nurses and patients. The two theoretical frameworks, MTC and LCM supported my study for improving quality of communication between nurses and patients.

Limitations of the Study

My study used a cross-sectional research design to examine the relationship of N95 masks and telehealth devices to the quality of communication between nurses and patients, and to compare the quality of communication when N95 masks were used versus a telehealth device. According to Di Girolamo and Mans (2019) one primary limitation of this cross-sectional study was I provided information about the differences in the quality of communication for the period in which the data was collected. Any differences in the quality of communication that may have existed before or after the data collection period cannot be known. Further, it is not known if there were any factors other than the independent variables (N95 masks, telehealth devices) that may have contributed to the perceived quality of communication between individual nurses who participated in this study and their patients. My study explored nurses' perceptions of effective communication and did not address patient experiences. This study was conducted in a single site, which limited the generalizability of the findings.

Recommendations

Studies of quality of communication in health settings reviewed found few involved nurses. For instance, of the studies that were reviewed on the effects of face

masks on communication in healthcare settings, only one study (Vitale et al., 2021) focused on nurses. There is need to conduct more studies that primarily involve nurses in hospital settings to understand better how different infection control measures affect the quality of communication between nurses and patients. Future research should include both nurses and patients and compare their perceptions of the quality of communication involving methods that ensure infection control and/or social distancing.

Studies reviewed, most used different instruments to measure communication and only few used similar instruments. The variation in how different studies measure quality of communication makes it difficult for one to compare the findings across studies and make consistent conclusions. The consistent use of specific instruments that have been proven to have a high reliability, such as the NQCPQ instrument to measure the quality of communication between nurses and patients would make such comparisons possible.

There were a noticeably higher number of men who reportedly used telehealth devices than those who used N95 masks. To determine whether or not this could have affected the findings, I recommend that future studies examine the relationship between the demographic characteristics of participants and their perceptions of the quality of communication. My study was conducted in one health facility. To improve the generalizability of findings, I recommend that future studies be conducted using respondents from multiple health facilities.

Implications

The findings of this study promote positive social change in several ways. Through this study, I compared how the use of N95 masks and telehealth devices affect

the quality of communication in hospital settings. The findings indicated that whereas telehealth devices enhanced the quality of communication between nurses and patients, when compared to N95 masks. My findings provide the organization to make informed decisions to prevent the spread of infection and ensure high quality provider-patient communication, preventing medical error thus improving safety. The findings of my study also contribute to patient outcomes in the long run. By knowing that telehealth is a more reliable method of social distancing when it comes to quality of communication, healthcare providers will prioritize it over N95 masks whenever possible. This will eventually improve patient's outcome by virtue of ensuring a good quality of communication. This will also apply in case there is another health pandemic in the future.

I recommend the use of telehealth devices that have quality video conferencing capabilities to enhance the use and perception of nonverbal cues. Secondly, I recommend that effort be made to ensure that patients who are treated using telehealth actually have adequate access to the necessary technology resources and training.

Conclusion

I entailed a comparison of the effects of telehealth devices versus use of N95 masks on communication between nurses and patients. The findings of my study indicate that the quality of communication between nurses and patients using telehealth devices is significantly better than quality of communication between nurses and patients using N95 masks. My findings and recommendations from this study are relevant to stakeholders to make informed decisions on remote and face-to-face healthcare service delivery. This

will also facilitate improved safety in the clinical setting and help steer cooperation between nurses and patients.

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Appendix A: Recruitment Email

Invitation Email

Email Subject: Opportunity to participate in a research study

Invitation Email Message

Hi, I hope this email finds you well.

My name is Tony Bloomfield, a Ph.D. student at Walden University. I kindly offer you the opportunity to participate in research that is a fulfillment of my doctoral study requirements.

Anyone willing to volunteer that meets the following requirements may participate in the study:

- Be a hospital-based staff RNs.
- Be a nurse that uses face masks or telehealth devices when attending to patients.
- Be a nurse that routinely performs direct patient care.

The following groups will not be eligible to participate in this study:

- Travel and temporary contract RNs.
- Managers, directors, and administrators.

About the study:

- Topic: Nurses' communication with patients using telehealth devices or N95 masks.
- Complete a 10 to 12-minute online survey on SurveyMonkey.
- Your responses to this survey will be anonymous.
- The invitation to participate will also be sent every day for two weeks.

You will have an opportunity to respond to this survey once a day over the next two weeks.

Importance of the study:

- It will help me better understand how devices aimed at infection control might affect communication between patients and nurses.

Appendix B: Screening Questionnaire

1. Are you a hospital-based staff RN?
Yes
No
2. Do you routinely perform direct patient care?
Yes
No
3. Do you use face masks or telehealth devices when attending to patients?
Yes
No
4. Are you a travel RN or temporary contract RN at this facility?
Yes
No
5. Is your primary formal role at this facility that of a manager, director, or administrator?
Yes
No

Appendix C: Permission to use the NQCPQ instrument

Sat 2/5/2022 1:05 PM

I am requesting permission to use your published instrument in my dissertation research study. Nurse Quality of Communication with Patient Questionnaire (NQCPQ) would be a good fit for my study as I am exploring the Comparison of the Effects

MY

Sun 2/6/2022 10:23 AM

To:

From:

Cc:

This is [copy](#) that has my permission to use the Nurse Quality of Communication with Patient Questionnaire (NQCPQ) in his academic (non-commercial) research projects.

Yours sincerely,

sv6_5_066 2022_y 22:05

I am requesting permission to use your published instrument in my dissertation research study. Nurse Quality of Communication with Patient Questionnaire (NQCPQ) would be a good fit for my study as I am exploring the 'Comparison of the Effects of Telehealth versus N95 on Nurse-Patient Communication.' I will be studying two groups on nurses. The first group will be communicating at the bedside wearing N95 masks and the second group will be using telehealth devices without masks outside of the room. Thank you for your assistance and for helping me achieve my educational goals.

Appendix D: Study Survey

Demographic Information

Instructions: Please choose the response that best describes you.

1. Have you previously completed this survey on another day?
 - a. Yes
 - b. No
2. Gender
 - a. Man
 - b. Woman
 - c. Transgender
 - d. Other
3. Age in years
 - a. 18 – 24
 - b. 25-34
 - c. 35-44
 - d. 45-54
 - e. 55 and over
4. Duration of practice as an RN
 - a. 0 - 6 months
 - b. 7-11 months
 - c. 1-2 years
 - d. Greater than 2 years (a.k.a. 2 years plus one day and longer).

5. Highest education qualification
 - a. Associate degree
 - b. Bachelor's degree
 - c. Master's degree or higher

Communication Survey

Instructions. Think about the last patient you cared for today where you had to use either an N95 mask or a telehealth device while communicating with the patient, then answer the following questions about that encounter. You may choose only one answer to each question.

6. Which of the following did you use when attending to the patient? (Choose only one.)

N95 mask

Telehealth device

7. The patient accepts conversation with me about her/his illness in the following way:

- a. Doesn't accept
 - b. Very difficult
 - c. Hampered
 - d. Good
 - e. Very good
 - f. Excellent
8. I fully understand the severity of the patient's illness, and I talk with him/her about it:
 - a. Conversation impossible
 - b. Very difficult

- c. Hampered
 - d. Good
 - e. Very good
 - f. Excellent
9. The patient talks to me about various themes, but avoids or is not able to answer my questions about her/his illness:
- a. Conversation impossible, as he/she does the opposite from what has been told
 - b. Answers my questions extremely difficult
 - c. Answers my questions hampered
 - d. Answers my questions very well
 - e. Answers my questions very well
 - f. Answers my questions excellent
10. The patient looks like he/she listens to what I am saying about his/her condition, but avoids or is not able to adequately cooperate with me while talking to him/her:
- a. He/she resists or does the opposite from what has been told
 - b. Does not resist but doesn't do what I am telling him/her
 - c. Cooperates but with difficulties
 - d. Cooperates well
 - e. Cooperates well
 - f. Cooperates excellent
11. I fully understand the severity of patient's illness, therefore only by observing the patient's gestures I conclude that my communication with him/her is:

- a. Not possible at all
 - b. Extremely difficult
 - c. Hampered
 - d. Good
 - e. Very good
 - f. Excellent
12. Generally speaking, the level of my communication with the patient while I carry out or monitor his/her pharmacotherapy, I can describe as:
- a. No communication
 - b. Extremely difficult
 - c. Hampered
 - d. Good
 - e. Very good
 - f. Excellent

Thank you for your participation!