Value and Impact of Nurse innovators Working in Academic, industry, and Government Settings: A Qualitative Study

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ABSTRACT

VALUE AND IMPACT OF NURSE INNOVATORS WORKING IN ACADEMIC, INDUSTRY, AND GOVERNMENT SETTINGS: A QUALITATIVE STUDY

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Northern Illinois University, 2022
Jeanette Rossetti, Director

This dissertation explores the value and impact of nurse innovators working in academic, industry, and government settings. A qualitative descriptive study was chosen to understand the contributions of nurse innovators and the outcomes associated with their innovative endeavors. The purpose of this study is to better understand the contributions of nurse innovators by answering the following research questions: 1) How do nurses perceive that nursing innovation adds value to and/or impacts patients or the United States health care system? 2) What metrics/outcome measures do nurse innovators identify as relevant or useful to evaluate innovation success? And 3) What methods/resources do nurse innovators report leveraging to disseminate innovation practice, initiatives, and outcomes?

Through the method of data analysis using NVivo software, 31 interviews with nurse innovators yielded four main themes: nurse innovators positively impacting their work setting environments, methods used by nurses to measure innovative practice, facilitating factors of innovation for nurse innovators, and barriers faced by nurse innovators. The significance of this study showcases how nurse innovators may impact and add value to the United States healthcare system and utilize methods to measure improved outcomes. Thus, it is imperative to understand
both the facilitating factors of innovation and the barriers faced by nurse innovators to improve innovative practices in various workplace settings.

The findings from this study can be leveraged to successfully design, measure, implement and evaluate innovative initiatives. An increase in global nurse-led innovation practices has the potential to completely transform health care. Also, it will be necessary for nurses to share their innovative practices through a variety of dissemination platforms and create opportunities for interprofessional partnerships to further enhance the outcomes of innovative endeavors.
NORTHERN ILLINOIS UNIVERSITY
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VALUE AND IMPACT OF NURSE INNOVATORS WORKING IN ACADEMIC,
INDUSTRY, AND GOVERNMENT SETTINGS: A QUALITATIVE STUDY

BY

OLIVIA A. LEMBERGER
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Doctoral Director
Jeanette Rossetti
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my life. And a very special thanks to my mom and dad for their unconditional guidance, love, and encouragement throughout my life. You have all made this moment possible.
DEDICATION

To past, present, and future nurse innovators
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“There are two classes of people in the world—those who take the best of what there is and enjoy it, and those who wish for something better and try to create it.” – Florence Nightingale

“Imagination does not become great until human beings, given the courage and the strength, use it to create.” – Maria Montessori
CHAPTER 1
INTRODUCTION

Innovation is one of the most recent necessities for the sustainability of organizations. The ability of an organization to stay competitive and relevant in today’s economy relies heavily on innovation, which is recognized as the best path to growth and prosperity (Mortati, 2015). Health factors, including the social determinants of health, require innovative practice to address complex issues such as food insecurity, social isolation, and homelessness (Clipper et al., 2019). To meet the increasing demands of health care, nurses need to develop and improve skills that serve as the foundation of innovation (Fielden et al., 2009). Innovation can be supported by the development of new roles such as boundary spanners, individuals who have the ability to connect different disciplines through experience and interpersonal skills (Cresswell et al., 2020). Nurses are innately innovative, using ideas to create a safer and more comfortable environment for patients (Marshall, 2019). Nurses are uniquely positioned to identify infinite opportunities for innovation (Croke, 2019; Muir, 2019; Kliger et al., 2010) because most innovations originate from staff working within organizations (McSherry & Douglas, 2011). The process of innovation requires the engagement of individuals in close proximity to the problem; therefore, frontline nurses must be deliberately involved for health care innovation to occur (Zuber & Weberg, 2020). Although nurses have been innovating for centuries, the term innovation has not been associated with the nursing profession. Nurses are repeatedly the silent collaborators in innovative initiatives (Leary et al., 2021).
Almost every clinical interaction in health care begins and ends with a nurse (Smith, 2019). Currently, there are 4 million nurses in the United States, the largest group of all health care providers (NCSBN, 2020), spending the largest amount of time with patients (Riehle, 2012). Nursing input is regarded as valuable information when designing new workspaces because nurses have first-hand insight regarding the unique needs of patients and current workflow processes by providing the majority of hands-on patient care (Clark, 2014). In a study regarding health care professionals, nurses in intensive care units were found to spend the majority of their time in close proximity to patients compared to 13% for physicians (Butler et al., 2018). Because of the holistic approach to patient care and the multitude of settings in which nurses provide care, nurses “have the ability to lead in the improvement and redesign of the healthcare system and its many practice environments” (Institute of Medicine, 2011, p.2). Despite the scientific and professional development of the nursing profession, nurses are often not given recognition for these attributes by the general public (ten Hoeve et al., 2013). Innovations created by nurses are changing the face of health care; however, too often, the innovations only diffuse within a small radius of individuals (Gomez-Marquez & Young, 2016).

The legacy of innovation invisibility in the nursing profession continues to exist. A nationwide survey conducted by Johnson and Johnson (2018) revealed that nearly half of Americans (41%) are unaware of the role nurses play in creating new medical tools and solutions. Unfortunately, the commonly held perception is that most of the innovations affecting nursing originate outside of the profession; however, nurses have innovated products such as the crash cart, stretcher, and ostomy bag, as well as processes such as phototherapy (Croke, 2019).

The innovative potential of nurses often goes unnoticed, and nurses are mistakenly viewed as the adopters rather than the sources of innovative initiatives. Patient care opportunities
are missed when nurses are not engaged in innovation initiatives (Glasgow et al., 2018).

According to the International Council of Nurses (2009), innovation is imperative to improving health care quality and improved patient outcomes. The American Organization of Nurse Executives (AONE) identified five characteristics of innovation: divergent thinking, failure tolerance, agility and flexibility, autonomy and freedom, and risk-taking (Joseph et al., 2019). Although these innovative characteristics and imperatives have been identified, the value and impact of nurse innovators remains an understudied phenomenon.

The American Nurses Association’s (ANA, 2021) Nursing Scope and Standards of Practice conclude that “innovation is a fundamental part of the nursing process” (p. 57) and have prioritized innovation as a strategic goal to “stimulate and disseminate innovation initiatives that increase the recognition and value of nurses” (ANA, 2016, p.2). Nurses engage in innovative initiatives on a daily basis, resulting in significant improvements in patient outcomes, quality measures, and cost-savings (International Council of Nurse, 2009; Muir, 2019).

However, the innovative contributions to health care by nurses are seldom recognized, publicized, or disseminated among nurses or the general public (Gomez-Marquez & Young, 2016; ICN, 2009; ten Hoeve et al., 2014). While the science of measuring the work of nurses continues to improve, it remains in the earliest stages of development (Malloch, 2015). A contributing factor to the lack of nursing innovation awareness includes the paucity of measurable outcomes to quantify the impact of nursing innovation successfully because innovation is regarded as a difficult concept to measure (OECD, 2018).
History of Nurse Innovators

During the past two centuries, nurses have impacted all aspects of health care through innovative practice. Between 1775 and 1815, nurses in Plymouth and Haslar British Naval Hospitals were innovative in their ability to create an optimal hospital environment by regulating environmental conditions, including cleanliness practices and mechanisms to improve ventilation (Spinney, 2019). Nurses were able to improve health outcomes based on the environmental conditions they provided for their patients. In a 1915 publication of The Nurse, innovation was discussed as a standard of the nursing profession

New and improved methods for the relief of patients are constantly being developed. Our own vision contemplates only the seeking out, sifting, and measuring of better nursing methods without regard to whether they are developed through the experience and research of physicians, nurses, or laymen. (The Nurse, 1914-1917, p. 48)

The American Journal of Nursing featured practical tips that later became a column known as “The Trading Post” in the early 1900s. This post provided an opportunity for nurses to have a forum to exchange ideas about improvements and innovations in health care (Gomez-Marquez & Young, 2016).

Florence Nightingale, a nursing pioneer, is inaccurately referred to as the lady with the lamp. In reality, she was an innovator who introduced a systematic method for handwritten records to be used within the profession of medicine (Hughes, 2006) and nurse-physician rounding (Dossey, 2010). Nightingale was the innovator of the polar-area diagram, which provided the collection, tabulation, and interpretation of descriptive statistics of the death rates of soldiers during the Crimean War from 1854-1855 using a graphical display (Audain, 2008). The
polar-area diagram was later used as a mechanism to support evidence-based arguments for sanitation reform (Dossey, 2010).

Harriet Tubman was an American abolitionist, political activist, and nurse. During the Civil War, Tubman worked determinedly to care for the sick and wounded soldiers (Donnelly, 2016).

She nursed our soldiers in the hospitals and knew how, when they were dying by numbers of some malignant disease, with cunning skill to extract from roots and herbs, which grew near the source of the disease, the healing draught, which allayed the fever and restored numbers to health. (Bradford, 2021, p. 24)

Tubman was an innovative advocate for human rights in her ability to transport more than 300 slaves to freedom in Canada through her underground railroad (Donnelly, 2016). Although Tubman never received pay or a pension for her work as a nurse during the Civil War (Singleton, 2019), she continued to innovate for health and human dignity by opening the Tubman Home for Aged and Indigent Negros in 1908. The Tubman home provided shelter, food, and clothing for individuals in her community and is now a National Historic Park under the auspices of the African Methodist Episcopal Zion Church (National Park Service, n.d.).

The Genesee Valley Nursing Association was established in 1900 by 30 nurses from the Rochester School of Nursing. These innovative nurses shaped the nursing profession by creating the New York State Nurses Association, which was the first nursing association in the United States (National Susan B. Anthony Museum & House, n.d.). The nurses recognized a need for a uniform and definite basis for the nursing profession and decided to organize a meeting to discuss the importance of regulated standards of nursing. In 1902, over 100 nurses gathered in Rochester, New York, to propose the bill, which later became law, now known as the Nurse Practice Act (Freeman, 2020). The keynote speaker at the meeting was Susan B. Anthony, a
fervent advocate for the profession of nursing (National Susan B. Anthony Museum & House, n.d.).

In 1927, Susie Walking Bear Yellowtail became the first registered nurse of Apsaalooke Crow descent and one of the first registered nurses of American Indian ancestry with a degree (from Boston City Hospital School of Nursing) in the United States (Ferguson, 2014). Instances of American Indian children dying from lack of access to medical care, the sterilization of Indian women without consent, and the inability of tribal elders to communicate their health needs to physicians were documented by Yellowtail throughout her nursing career. She was innovative in her creation of Community Health Representatives outreach programs on reservations, which improved advocacy, better access to care, and living conditions (Ferguson, 2014). In 1962, Yellowtail was honored with the President’s Award for Outstanding Nursing Health Care by President John F. Kennedy (Native Nurses, 2016).

Mabel Keaton Staupers was a visionary nurse who was recognized for eliminating segregation in the Armed Forces Nursing Corps during World War II. In 1920, she helped establish the Booker T. Washington Sanitarium, which was dedicated to treating black Americans with tuberculosis, and mentored African American nurses on how to gain memberships in national and state-led nursing organizations (Brieske, 2012). Because of her innovative efforts to advocate for equal rights for black nurses, she was awarded the Spingarn Medal from the National Association for the Advancement of Colored People (NAACP). She authored *No Time for Prejudice: A Story of the Integration of Negros in Nursing in the United States*, which recounts the obstacles she faced during her nursing career in her tireless fight for equity and justice (McNeill, 2020).
Background of Innovation

Innovation is derived from the Latin word innovare, which means to renew or change (Luleci et al., 2015). Gabriel Tarde’s seminal work on social theory in 1903 examined the relevance and complexity of innovation. “Our problem is to learn why given one hundred different innovations conceived at the same time…ten will spread abroad while ninety will be forgotten” (Tarde, 2014, p. 206). Tarde thought of innovation as a ripple effect of imitation and noted that an individual would prefer a certain innovation to others based on its usefulness and the prevalence of innovation adoption by society. The usefulness of an innovation depends on previously established values already in place. According to Tarde, the more people invent, the more people become inventive and open to new discoveries. Tarde’s measures of innovation were concentrated on usefulness and sustainability.

In 1934, Joseph Schumpeter defined innovation as the introduction of a new good. Schumpeter, who wrote The Theory of Economic Development believed anyone seeking profits must innovate. Peter Drucker (1985), who is known as the founder of modern management, was interested in how individuals worked with their minds rather than their hands. His book, Innovation, and Entrepreneurship, illustrates that systematic innovation relies on monitoring seven sources for innovative opportunity:1) the unexpected (e.g., success, failure, outside event), 2) the incongruity (reality as it is and as it is assumed to be), 3) innovation based on process need, 4) changes in industry or market structure, 5) demographic (population changes), 6) changes in perception, mood and meaning, and 7) new knowledge that is both scientific and nonscientific (p. 35). Drucker encouraged innovators to purposefully search for sources of innovation and believed that “Innovation is the tool that can exploit change as an opportunity.”
Innovation is capable of being presented as a discipline, capable of being learned, and capable of being practiced” (p. 20).

The term innovation has been described as one of the most overused catchphrases in health care, pertaining more to an organizational desire for discussing what innovation might look like than the actual implementation of innovative solutions (Lazarus & Fell, 2011). The term invention connotes a detailed design or physical representation that is novel when compared to existing practices “that includes the invention and the application of the invention” (Gambatese & Hallowell, 2011, p. 553). Unlike invention, which is the creation of something new, innovation is a “purpose-driven, team-based, systematic set of activities whose goal is to bring added value to individuals and organizations” (Endsley, 2010, p.16).

Innovation Readiness

Organizations look to innovations to create value and provide an opportunity to stay on the cutting edge of technology and growth (Stempfle, 2011). For health care organizations to survive, innovation needs to be felt as part of a collective mission statement, which is supported and practiced by all employees (Corbin et al., 2012). Growth and development are at risk if health care organizations are unable to infuse innovation practices within the environment. The inability to change at the same pace with the environment is a key factor for the failure of long-term sustainability for organizations. Organizations are no longer effective or competitive when they decide to continue with established norms (Stempfle, 2011). The ability to successfully innovate is a serious organizational concern, and some believe ignoring the need to innovate is ensuring defeat in today’s health care environment (Lazarus & Fell, 2011).
The nature of the organizational environment will determine the likelihood of an innovation’s success. The environmental climate may be more of a factor of innovation success than the innovators themselves (Angus et al., 2003). Greenhalgh et al. (2004) conducted a comprehensive literature review of innovation and identified six key elements that indicate innovation readiness within an organization. These elements include a) tension for change or a perception that change is needed; b) a good fit between the proposed innovation and the values, norms, and goals of the system; c) an ability to adequately assess implications of the innovation; d) the system supports and advocates for innovation; e) the system has the ability and capacity to devote time and resources to the innovation; and f) the system has the capacity to effectively evaluate the innovations intended and unintended consequences and feed-back the information into the system (Greenhalgh et al., 2004).

Theoretical Framework

The Triple Helix model conceptualized by Henry Etzkowitz and Loet Leydesdorff was created in the mid-1990’s (Grant et al., 2014). This model describes an interactive relationship among universities, industries, and governments based on the cooperation of participants within the institutions. How well institutions are able to collaborate defines the effectiveness of innovation practices within that region (Birkner & Mahr, 2016). Unlike previous models of innovation that were linear, the Triple Helix model is a fluid and constantly evolving group of spheres that work cohesively to provide knowledge sharing and opportunities for increased innovation (Dzisah & Etzkowitz, 2008). The interactions that operate as inter-dependent institutional spheres improve the likelihood for successful innovation and long-term sustainable development initiatives (Dzisah & Etzkowitz, 2008). Developing a plan for a large innovative
initiative includes utilizing the Triple Helix Model to ensure that academic, industrial, and government agencies are involved and equally represented (Management Systems International, 2012).

![Figure 1. The Triple-Helix Model (Etzkowitz & Leydesdorff, 2000)](image)

Joint initiatives are implemented within all spheres fostering a collaborative partnership of innovation and entrepreneurship (Ranga & Etzkowitz, 2011). In a balanced state, these spheres assume each other’s responsibilities at different times. For example, industries may offer educational opportunities, industries may conduct research, and government agencies may utilize industry marketing techniques for government programs (Granet al., 2014). A shift from defining innovation to a single institutional sphere to a broader interaction incorporates university, industrial, and government organizations in economic, environmental, and societal initiatives. A focus on boundary permeability and encouraging individuals to move between and among the various spheres helps to create new possibilities for innovation (Ranga & Etzkowitz, 2011). Instead of viewing the Triple Helix as a “thing” or noun, it should be understood as a verb and as a model in constant motion (Grant et al., 2014).
Etzkowitz (2008) realized his creation of the Triple Helix emerged from spheres into spaces that form a foundation of knowledge, consensus, and innovation. The knowledge space of the Triple Helix focuses on the collaboration of different individuals with an aim to improve the surrounding conditions for innovation through research and activity development. The consensus space entails the process of individuals working together to create, analyze, and formulate plans to produce a specific strategy. Consensus spaces within the Triple Helix are where individuals create ideas and strategies among all relationship spheres and institutional sectors (Grant et al., 2014).

The innovation space is where the innovation is realized, and the plan for entry into the societal domain is created (Etzkowitz, 2002). The innovation spaces within the Triple Helix are where goals are realized. As Schumpeter indicated, “It is not the owners of stagecoaches that build railways” (Schumpeter, 2012, p. 66). Insight from all spheres provides opportunities to innovate from a broader perspective. Recently, innovation has become one of the essential sources for economic growth for regional and national markets (Birkner & Mahr, 2016). The theme of collaborative innovation at the academic level as well as within business and government has improved outcomes such as cost reduction, technological growth, and research development (Etzkowitz, 2008).
The Triple Helix Circulation System is an alternate model of innovation development based on circulating rather than separate institutional spheres (Dzisah & Etzkowitz, 2008). “This model enhances opportunities for rapid socio-economic development in the transition towards a knowledge-based society” (Dzisah & Etzkowitz, 2008, p. 108). The circulation of people promotes cross-institutional knowledge sharing and provides the opportunity for viable ideas from all spheres to be introduced through the circulation of people. The circulation of ideas provides an innovation network to disseminate innovation resources and a space for innovation researchers and practitioners to collaborate. Finally, the circulation of innovation assists larger-scale initiatives by increasing the equity of contributions and reciprocity from innovators in university, industry, and government settings (Dzisah & Etzkowitz, 2008).

Conceptual Framework

The Innovation in Healthcare Framework created by Omachonu and Einspruch (2010) outlines the multi-dimensional factors involved in health care innovation. At the center of health
care innovation are patients and health care providers. For health care innovation to be successful, intentional and directed concerted focus needs to be placed on creating an environment in which the health care provider can successfully address the needs of patients in three areas: how the patient is seen, how the patient is heard, and how the patients’ needs are met. Addressing these questions will uncover current gaps in patient care and provide direction for innovation initiatives.

Design empathy is an approach for understanding real-world experiences to address current challenges through innovation (Battarbee, Suri, & Howard, 2015). The Stanford Design School explains the design thinking process as cyclical and complex, beginning with empathy, which leads to ideation, prototyping, testing, and sharing (Plattner, n.d.). Hasso Plattner, a German entrepreneur, and philanthropist who wrote *An Introduction to Design Thinking Process Guide* used by the Stanford Design School, states that “to create meaningful innovation, you need to know your users and care about their lives” (p. 1). Empathy is a foundational component of the nurse-patient relationship and facilitates the ability to understand the needs, feelings, and perspectives of patients (Ghaedi et al., 2020; Rohani et al., 2018). Patient-centered innovation ensures that patients and providers are co-collaborators in planning, developing, and monitoring innovative initiatives (Thakar & Cundiff, 2020).

Patients are the central stakeholders and end-users of innovation. From the patients’ perspective, the benefits of innovation include improved patient experience, decreased wait times, and improved physiological well-being (Omachonu & Einspruch, 2010). Design thinking methodologies position patients as participants in the innovation process because of their experience as users who possess first-hand insight into the perceived problem (Roddy & Polfuss, 2020). Patients, caregivers, and the wider community are frequently absent from discussions
surrounding the adoption, implementation, and the sustainability of innovations (Nolte, 2018). To fully involve patients as key stakeholders in the innovation process, health care providers should continually monitor patient feedback, collectively evaluate the feedback, and create a systematic process for ensuring patients are able to identify opportunities that may lead to innovations (Endsley, 2010).

Health care organizations serve communities by providing individuals with treatment regimens, diagnoses, prevention resources, education materials, the generation and translation of research, and community outreach programs. To provide the necessary resources, health care organizations must deliver safe and quality patient care and improve outcomes while controlling cost and efficiency practices within the organization. Health care organizations often arrive at innovation through a need to improve health care access and delivery (ICN, 2009). The innovation of information technology has drastically improved patient care. For instance, the replacement of paper-based records with Electronic Health Records (EHR’s) has improved patient outcomes by providing physicians with automatic alerts of critical patient results and simplified workflow by decreasing time spent documenting (Evans, 2016). The conceptual framework of innovation in health care examines the multi-dimensional factors that influence innovation in healthcare settings and provides a patient-provider-centered approach to creating successful, meaningful, and sustainable innovations (Omachonu & Einspruch, 2010). The framework provides a model to promote health care innovation through the domains of quality, cost, safety, efficiency, and outcomes (see Figure 3).
Figure 3: Conceptual framework for innovation in healthcare.

Purpose

Norma Lang, a leading authority on nursing standards, stated that “if we cannot name it, we cannot control it, practice it, teach it, finance it, or put it into policy” (Clark & Lang, 1992, p. 109). For 18 continuous years, the Gallup Poll has rated nursing as the most honest and ethical profession in the United States (Reinhart, 2020), which is valuable information and provides a measure of public trust in the profession of nursing. Similar research and evidence are needed for the work of nurse innovators. Nurses contribute to improved patient outcomes; however, there is a lack of evidence demonstrating how nurses contribute (Jones, 2016). Without a system in place to meaningfully capture data surrounding the work of nurses, it remains difficult to produce evidence of how nurses affect patient outcomes (Beale et al., 2021). Understanding the process of innovation includes identifying how innovation can be enhanced and measured (Gambatese & Hallowell, 2011). Empirical data are needed to describe the contributions of nurse innovators across clinical settings, patient populations, geographic locations, and time. It is vital that nurses
fully understand the importance of how their profession directly impacts quality measures, patient care, and fiscal outcomes related to innovation practice (Kliger et al., 2010). This study explored the value and impact of nurse innovators on the United States healthcare system by examining the work of nurse innovators in academic, industry, and government settings. This study provides visibility to the practice of nursing innovation by answering the following research questions:

Research Questions

The study was guided by the following research questions:

1. How do nurses perceive that nursing innovation adds value to and/or impacts patients or the United States healthcare system?

2. What metrics/outcome measures do nurse innovators identify as relevant or useful to evaluate innovation success?

3. What methods/resources do nurse innovators report leveraging to disseminate innovation practice, initiatives, and outcomes?
CHAPTER 2
REVIEW OF LITERATURE

Innovation Taxonomy

Among human beings, there is an innate desire to systematically organize information (Clark & Lang, 1992). The organization of knowledge and the resulting forms of taxonomic structures are present in the earliest works of language dating back centuries (Bhat & Sheikh, 2014). The word taxonomy is often associated with the classification of biological organisms; however, it has emerged as a tool for the hierarchical categorization of information (Hedden, 2010). Taxonomy is a knowledge structure system constructed on the principles of classification and often used to provide a structured path for the successful retrieval of information (Bhat & Sheikh, 2014). Formally categorizing knowledge requires an understanding of the intended audience (Roberts-Witt, 1999).

Noy and McGuinness (2001) state that ontologies, a subset of taxonomies, are useful in their ability to a) provide a common understanding of the structure of information, b) enable the reuse of domain knowledge, c) make domain assumptions explicit, d) separate domain knowledge from operation knowledge, and e) analyze domain knowledge. Hedden (2010) asserts that taxonomies bring users and content together, while Samler and Lewellen (2004) contend that taxonomies enable users to discover answers to questions they did not think to ask. The lack of taxonomy related to the work of nurse innovators has resulted in an inconsistent classification of
how the work of nurse innovators is organized, measured, and reported. This gap has contributed to a fragmented understanding of the practice, impact, and value of nurse innovators.

The Organization for Economic Co-operation and Development (OECD, 2018) is an international organization that works to shape policies to foster equality, prosperity, and well-being for all individuals. The organization provides evidence-based international standards to create solutions to combat a range of social, economic, and environmental issues. Some of the innovation indicators used by the OECD include research and development, financial and insurance activities, water supply and waste management, manufacturing of basic metals, electricity gas steam and air conditioning supply, and advertising and market research. The OECD (2005) has played a key role in the development of international guidelines by conducting analytical studies using innovation-related indicators and micro-data. The OECD classifies innovation into four categories: product innovation, process innovation, marketing innovation, and organization innovation (Proksch et al., 2019). Other taxonomies prevalent in innovation literature include disruptive, radical, social, incremental, sustaining, and frugal innovation. This study will demonstrate how nurse innovators have successfully contributed to the aforementioned innovation taxonomies.

**Product Innovation**

Product innovation is the introduction of a good or service that is new to the intended users. This may include improvements to components and materials, software, or end-user ability. A nursing exemplar of product innovation includes Elise Sorensen, a Danish nurse whose sister had surgery for colon cancer. Her sister had an appliance for her waste that had a foul odor and leaked constantly (Stokowski, 2014). In 1954, Sorenson invented a plastic pouch
that could adhere to her sister’s body without causing pain. The pouch reduced leaking and odor without injuring the skin. This plastic pouch was the innovation for the ostomy bag (Stokowski, 2014).

Anita Door, a nurse, working in the emergency department, realized it took too long for the staff to round up the equipment needed to treat a critically ill patient. Door gathered a list of supplies needed in any type of emergency. In 1968, she and her husband John measured the supplies and built a red-painted wood cart in the basement of their home. The cart became known as the crisis cart and was the first prototype of the future crash cart (Hanink, n.d.). The crash cart has become such a valuable piece of equipment that the maintenance and daily monitoring of crash cart supplies has become a requirement for hospital accreditation (Hanink, n.d.).

Bessie Blount, a nurse, working with disabled veterans from World War II, invented an electronic feeding device that allowed veterans to eat independently (Sullivan, 2013). The patient would bite down to activate a motor that would trigger food to be dispensed through a spoon-shaped mouthpiece and then shut off automatically to allow time for the patient to chew (Padnani, 2019). Blount, who later became a physical therapist, also invented a disposable hospital basin (Sullivan, 2013).

**Process Innovation**

Process innovation is a new innovation or one that significantly improves a process or delivery method. The innovation may include improvements to techniques, equipment, and/or software. Sister Jean Ward (a British nurse in charge of the premature nursery at Rochford General Hospital in Rochford, Essex, England) realized that babies positioned closer to the
window and exposed to more sunlight had fewer incidents of jaundice. Ward was the innovator of contemporary phototherapy (Maisels, 2015). Nurses who are involved in the implementation of process innovation create a positive impact on the work environment and ultimately improve patient care (Barker, n.d.).

Margaret A. Piehl, an ICU nurse, working in a small community hospital, recognized that when patients with acute respiratory distress syndrome (ARDS) were placed in the prone position, their oxygenation improved (Damuth, 2020). Piehl conducted an observational study that included five patients with ARDS, in which she described the effects of extreme position changes on arterial oxygenation (Piehl & Brown, 1976). This seminal paper was published in *Critical Care Medicine* in 1976 and has informed the process of proning during the COVID-19 pandemic.

The Hospital-Acquired Pneumonia Prevention by Engaging Nurses (HAPPEN) program initiated by Shannon Munro, Ph.D., NP, encourages patients to practice consistent oral hygiene by brushing their teeth a few times a day to reduce the risk of developing pneumonia. In 2016, when the HAPPEN program was initiated, there was a 92% decrease in the rate of non-ventilator-associated hospital-acquired pneumonia (NV-HAP). Since then, the average pneumonia rates have decreased 40-60%, and the program has now been replicated in 111 VA facilities. The continued success of the HAPPEN program has led to the creation of the National Organization for NV-HAP Prevention (NOHAP), which is a prevention program led by the VA to reduce the rates of NV-HAP nationwide (VAntage Point, 2021).

Angie Gray, a nursing director for the Berkeley-Morgan County West Virginia Board of Health, is the innovator of a harm-reduction program to address the opioid crisis. Gray’s program, which started in 2017, served over 1,000 patients the first year and provided a syringe
and needle exchange to reduce the spread of disease and death (Daily Nurse, 2018). The harm reduction program also provides education about recovery and is completely anonymous. More than 100 of the patients who have utilized the harm reduction clinic have reported they are no longer using (McCormick, 2018). On June 19, 2019, Angie testified during a hearing on Capitol Hill about the need for federal funding to expand care and resources to successfully combat the opioid crisis (Vincent, 2019).

**Marketing Innovation**

Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing with the aim of addressing customers’ needs (OECD, 2005). A unique characteristic of marketing innovation is the implementation of a method not previously utilized. Blake Lynch, known to many as Nurse Blake, has created an online fan base of more than 650,000 Facebook followers, 294,000 Instagram fans, and 28,000 YouTube subscribers. His media content provides a wide array of content, including comic impressions of nursing students, instructors, and advice on how to choose a nursing school. In 2013, Lynch launched a national campaign, Banned4Life, to address the Federal Drug Administration’s ban on gay and bisexual males donating blood (Hamstra, 2019). Lynch created a petition to raise awareness of the blood deferral policy that led to the 2015 reversal of the policy (Hamstra, 2019). Lynch’s innovative approach to bringing awareness to issues while building an online nursing community created a global support system for nurses.

In 1910, A. Lauder Sutherland, a nurse in charge of the Hartford Hospital Training School, invented the first simulation mannequin (Kelley, 2020). At that time, nurses were using
straw-filled dummies but required a more realistic mannequin for clinical education. The success of Mrs. Chase, the first mannequin used for simulation, led to duplication and distribution to several medical institutions around the United States (Hiestand, 2000).

Figure 4. Advertisement for the Mrs. Chase hospital doll in the Hospital Manager in 1921.

Organizational Innovation

Organizational innovation is the implementation of a new method in an organization’s business practices, environment, or external relations. The No One Dies Alone (NODA) program was founded in 2001 by Sandra Clarke, an intensive care nurse at Sacred Heart Medical Center in Eugene, Oregon. In 1986, one of Clarke’s patients asked her to stay in his room for a while. She was called to another patient’s room but told him she would return as soon as possible. When Clarke returned, he had died (Kessler, 2008). She noticed there was no continuous support system in place for terminal patients without family or friends. The NODA program she created provides an opportunity for volunteers to sit with terminally ill patients to ensure that no one dies
alone. Clarke’s innovative solution is now helping terminally ill patients worldwide (Kessler, 2008).

Worldwide Community First Responder (WCFR) is a nonprofit charitable organization founded in 2011 by Jackie Cassagnol, a nurse. The mission of the WCFR organization is to prevent deaths worldwide through education and training, including first aid, disaster preparedness, and health education (Nursing Centered, 2021). Volunteers for the organization have trained over 350,000 people in life-saving skills and have served communities in the United States, Haiti, Ireland, China, and South Africa (Nursing Centered, 2021).

Disruptive Innovation

Innovation has been classified as disruptive, radical, social, incremental, sustaining, and frugal. A disruptive innovation helps create a new market and value network. The concept of disruptive technology is widely used because few technologies are intrinsically disruptive (Christensen et al., 2017). A key to disruptive innovation is that, as opposed to sustaining innovation, it does not take place with established competitors. The Organization for Economic Cooperation and Development (OCED, 2005) defined disruptive innovation as “having a significant impact on a market and on the economic activity of firms in that market and focuses on the impact of the innovations as opposed to their novelty” (p. 58).

A nursing exemplar of disruptive nursing innovation is a clinic run by nurse practitioners (NP). In 2007, Wendy L. Wright, a nurse (APRN and FAANP) and economic disruptor, created an innovative solution to patient care delivery by opening a primary care clinic entirely owned and operated by nurse practitioners and medical assistants (Wright, 2020). The clinic improved patient outcomes and reduced hospital admission rates, and cost health insurance organizations
$60 less per month when compared to physician-operated clinics. In 2013, the NP practice owners and Blue Cross/Blue Shield formed the first accountable care organization (ACO) in the country that was entirely comprised of patients cared for by nurse practitioners (Wright, 2020). This disruptive innovation created an opportunity to make products and services more available and affordable to the larger population.

**Radical Innovation**

According to information in the *Harvard Business Review*, radical innovation focuses on long-term impact and may involve displacing current products, altering the relationship between the customers and supply (Stringer, 2000). Radical innovation is an invention that destroys or supplants something that is already established (O’Sullivan & Dooley, 2009). The airplane, for example, was not the first mode of transportation, but it was a radical innovation because it allowed commercialized air travel to develop and prosper.

A nursing exemplar of radical innovation is Mary Breckenridge, who established the Frontier Nursing Service in 1925 (Castlenovo, 2020). This innovative service provided healthcare in the Appalachian Mountains by horseback and created the ability for nurse-midwives to visit patients in their homes. The Frontier Nursing Service lowered the maternal mortality rate from the highest in the country to below the national average.

The Flying Nightingales were a secret group of 200 volunteer British civilian nurses who comprised the RAF’s Air Ambulance Unit, which operated under the 46 Group Transport Command (Bowman, 2015). The Flying Nightingales flew in camouflaged planes under heavy fire to the battlefront, risking their own lives to evacuate more than 100,000 wounded soldiers during the Second World War. These volunteer nurses were the first women to be sent into war
zones by the British Government and played an essential role in keeping thousands of soldiers alive for long enough to receive life-saving operations (Bowman, 2015).

**Social Innovation**

Social innovation refers to innovative endeavors motivated by the desire to meet social needs within the community (Mulgan, 2006). Social innovations often address the needs of vulnerable populations and focus attention on solutions that provide social value (Stanford Business, n.d.). Three key drivers to social innovation include the exchange of ideas and values, a shift in roles and relationships, and the integration of private capital with public and philanthropic support (Stanford Business, n.d.).

A nursing exemplar of social innovation includes Ruth Nita Barrow, a nurse practitioner practicing in Barbados in 1954 who became the first West Indian Matron of the University College Hospital (UCH) in Jamaica. For 15 years, Barrow was a health consultant for the World Health Organization (WHO) and directed an extensive research project on nursing education. In 1980, she accepted the role of the United Nations Director of the Global Forum for Women and was able to use her position as a platform to improve the health status of women around the world (Barbados Faces Extraordinaire, n.d.). Her intolerance of injustice led to her membership on the team of the Commonwealth Group of Eminent Persons. In 1990, Barrow was the only woman on a team who was asked to negotiate the release of Nelson Mandela. Barrow was innovative in her novel approach to negotiation. Drawing on her therapeutic communication skills, she was instrumental in securing Mandela’s release from prison. His release precipitated the end of apartheid in South Africa (Barbados Faces Extraordinaire, n.d.).
Marca Bristo was a nurse advocate for people with disabilities and was instrumental in the passage of the Americans with Disabilities Act of 1990, which outlawed discrimination against 61 million Americans with disabilities (Hayman, 2019). As the founding president and CEO of Access Living, a non-profit organization that advocates for people with disabilities, Bristo was responsible for reshaping several policies in Chicago for people with disabilities, which served as the basis for national and international legislation. Because of her expertise, Bristo was consulted during several presidential administrations. For 40 years, Access Living has made significant contributions to advocacy for disability equity and inclusion (Hayman, 2019).

In 1979, Joe Hogan was a nurse with an associate degree working as a supervisor in a large community hospital in Mississippi. He decided to further his education and pursue a bachelor’s degree, but the closest program that accepted men was almost 150 miles away (Stuart, 1981). Hogan applied to the Mississippi University for Women, a state-supported school in his hometown, but was denied admission. He was told he could audit classes but could not receive credit. Hogan sued the school, claiming that his 14th Amendment rights had been violated. His case reached the Supreme Court, which ruled in his favor in 1982. Justice Sandra Day O’Connor, the first woman appointed to the Supreme Court and a victim of gender discrimination in her own life, delivered the court’s majority opinion (Stuart, 1981). Joe Hogan was innovative in his ability to challenge existing stereotypes that only women belonged in the profession of nursing.

In 1984, Claire Bertschinger was working as a nurse with the Red Cross in Ethiopia, where she helped save and care for children affected by famine. During an interview with the BBC, Claire detailed the events of the famine and shared her personal stories about those in need. Her interview inspired singer Bob Geldof to set up the Live Aid Concerts to raise funds for famine relief (Elliott, 2005). Live Aid was staged on Saturday, July 13, 1985, with performances
by U2, Elton John, Queen, the Who, Eric Clapton, Tom Petty, Neil Young, and many other artists. Live Aid was the biggest relief fund ever mounted. It raised $127 million and was responsible for saving over two million lives in Africa (History.com Editors, 2009).

**Incremental Innovation**

Incremental innovation is defined as the gradual or continuous improvement of existing products or services. Incremental innovation builds on established knowledge, creates results from steady improvement, and targets existing markets with existing technology. Some of the benefits of incremental innovation include enhancing growth with minimal risk, addressing customers’ needs through identified suggestions, and prolonging the market life of a service or product (Procto, 2019). Elizabeth Kenny was an Australian nurse who cared for patients during World War I. In 1927, Elizabeth was frustrated with how difficult it was to transport patients during emergency situations. She designed a versatile stretcher in which patients could be transported in various positions (Hely, 1927). The stretcher could also be used as an operating table in areas without a hospital or for situations when patients needed immediate treatment on the front lines. Elizabeth’s innovation of the stretcher is currently used by first responders and critical care health providers around the world.

Joey Ferry and Taofiki Gafar-Schaner innovated Safe-Seizure™, which are bed rail pads to promote improved seizure-precaution protocols (ANA, 2020). The seizure pads are inflatable and water-resistant and reduce the need for storage. The Safe-Seizure pads decrease hospital-acquired infections and save money for linen use. A survey conducted on two hospital nursing units revealed a 31% decrease in linen use and that 94% of nurses surveyed stated that the Safe-Seizure pads were safer than the pads currently in use (ANA, 2020). Ferry and Gafar-Schaner
received the nurse-led team ANA innovation award in 2020 to further support their innovative endeavor. The Safe-Seizure pads are produced in standard and crib bed sizes and are currently used by 13 hospitals nationwide.

**Sustaining Innovation**

A sustaining innovation improves existing products. Some sustaining innovations are dramatic breakthroughs, others may be routine, but the purpose is to sustain the performance trajectory of the innovation (Christensen et al., 2017). A sustaining innovation exemplar includes a nurse-led primary health center in Papua New Guinea that leveraged short-wave radios, community-based outdoors remote broadcasting systems, and local newspapers to deliver information and increase knowledge about HIV/AIDS (ICN, 2009). Nurses identified vital local stakeholders consisting of youth and women’s groups in 14 villages to raise awareness of health services offered in remote clinics. Free workshops offered to community members focused on prevention and other primary health care topics such as prenatal care and immunizations. Following one of the health care workshops, 365 people arrived at the health clinic for HIV testing (ICN, 2009).

Help, understanding, and guidance (HUG) your baby is an evidence-based educational program that provides resources to new mothers and families to address issues surrounding breastfeeding, stranger anxiety, and excessive crying. HUG your baby, developed by Jan Tedder BSN, FNP, IBCLC, was a 2020 American Nurse Association innovation award winner for providing family-friendly videos and engaging material to support new moms and the nurses who care for them to improve their understanding of common behaviors that are often
misinterpreted. Over 800 healthcare professionals completed the HUG your baby online courses in multicultural languages (ANA, 2020).

**Frugal Innovation**

Frugal innovation is the process of lowering the complexity of a product or production and removing any non-essential features to offer products to a wider range of people without compromising on quality. To be innovative in health care means to span existing knowledge boundaries in the hopes of pioneering something that will be useful to patients (Nolte, 2018). Nurses who have participated in successful innovation practices have improved environmental and operational dimensions of healthcare organizations and improved health care equity for vulnerable populations (Nolte, 2018). Physicians and nurses conducted a research study and found that using turmeric powder and honey decreased oral mucositis in cancer patients when compared to pharmacologic alternatives (Nagarale & Rathod, 2016). This frugal innovation resulted in a decreased cost for care for patients.

In 2015, Jennifer Grenier, DNP, CNML, started the Surplus Project to decrease food insecurity by packaging surplus food from hospital cafeterias in Illinois. The surplus food that is donated to homeless shelters has provided over 50,000 meals and has expanded to more than ten organizations (Grenier & Wynn, 2018). The second phase of the project, Food Is Medicine, began in 2019 and provides patients discharged from the hospital with one months’ worth of food (Lisser, 2019). Since 2015, the Surplus Project is currently providing 700 meals each month and 8,400 meals per year for individuals to successfully address the social determinant of health in the Chicagoland area (Grenier & Wynn, 2018).
There is a robust history of using outcome measures to demonstrate improved patient care within the profession of nursing. Nursing outcomes have demonstrated improvement in transitional care models, bedside nursing practice, nurse staffing ratios, and patient outcomes. Nursing innovation outcomes can be compared in academic, industry, and government settings through the lens of the Triple Helix model. Additionally, nursing innovation outcomes provided in the Conceptual Framework for Innovation in Healthcare Model can be explored through quality, cost-saving, safety, and efficient nursing innovation initiatives.

Landmark research conducted by Aiken et al. (2003) demonstrated that hospitals with higher proportions of baccalaureate-prepared nurses have better surgical outcomes, which was one of the first studies to link improved patient outcomes to the individual and collective characteristics of nurses. Continued nursing research has demonstrated a correlation between nursing care delivery and patient outcomes (Lucero et al., 2010). In 2013, the American Nurses Credentialing Center (ANCC, 2011) suggested quality outcomes and the individual activity level regarding nursing professional development, which included professional practice behaviors, leadership skills, critical thinking skills, nurse competency, high-quality care based on best-available evidence, improvement in nursing practice, improvement in patient outcomes, and improvement in nursing care delivery (p. 8). A systematic quantitative review of the association between nursing skill mix and nursing-sensitive patient outcomes revealed that 12 patient outcomes were inversely related to nursing skill mix, meaning higher nursing skill mix was significantly associated with improved patient outcomes (Twigg et al., 2019). The 12 outcomes include length of stay, acute myocardial infarction, restraint use, failure to rescue, pneumonia,
sepsis, urinary tract infection, mortality/30-day mortality, pressure injury, infections and shock, cardiac arrest and heart failure, and upper gastrointestinal bleeds.

Naylor et al. (2011) recommend several strategies based on the comparison of outcome measures to guide the implementation of transitional care under the Affordable Care Act. These strategies included promoting the adoption of effective interventions, including the Community-Based Care Transitions program and Medicare shared savings and payment bundling options which reduced readmission rates through six-twelve months. The concept of examining outcomes as the validation of quality nursing care has typically been assessed in terms of morbidity, mortality, length of stay, and readmissions (Portney & Watkins, 2000). This concept has extended to measuring outcomes related to patient safety, satisfaction, quality of life, patient preferences, and self-assessment of functional capacity (Wilson et al., 2008).

A quantitative assessment of patient and nurse outcomes of bedside nursing was conducted in seven medical-surgical units in a large university hospital (Sand-Jecklin & Sherman, 2014). Statistically significant improvements were noted post-implementation, including improved patient involvement in care and nurse-nurse communication. The nurses reported increased accountability and improved prevention of patient safety issues related to the implementation of a bedside nursing report (Sand-Jecklin & Sherman, 2014). This study exemplifies how measuring quantifiable outcomes provides additional support for ensuring best practices in nursing.

A meta-analysis conducted by Kane et al. (2007) examined the impact of nurse staffing on patient outcomes. This study revealed an association between higher staffing levels and reduced rates of hospital-related mortality, hospital-acquired pneumonia, failure to rescue, unplanned extubation, and nosocomial bloodstream infections. Policies that dictate staffing
levels require relevant outcome measures related to the impact of nurse staffing levels on patient safety. A study conducted by Evans and Kim (2006) examined the relationship between adverse patient events and staffing levels was used to investigate the accuracy of California’s mandated minimum nurse-to-patient ratios.

An innovative initiative called the Unique Nurse Identifier (UNI) was created to provide evidence of the value of nursing patient care delivery (Beale et al., 2021). The UNI creates increased visibility for the interventions associated with patient care delivery, such as fall prevention, by connecting data through various healthcare technology systems (Beale et al., 2021). The National Council of State Boards of Nursing (NCSBN) developed an NCSBN ID that was matched to nurses when they registered for the NCLEX exam, and nurses who took the NCLEX prior to 1994 were also assigned an ID number (Beale et al., 2021). In 2020, the Alliance for Nursing Informatics (ANI), in conjunction with the Nursing Big Data workgroups, created a policy statement to increase nurses’ knowledge and understanding of the NCSBN ID (Beale et al., 2021). This approach may create an opportunity to leverage existing data to provide a range of metrics associated with the UNI that accurately reflect the work of nurses (Welton & Harper, 2016).

Other intangible outcome measures that contribute to the value of nursing include reducing pain and suffering, improving the reputation of health care organizations, and reducing malpractice claims and employee turnover (Dall et al., 2009). The impact of nurses on patient recovery times and preventing nosocomial infections reduce the need for physician services (Dall et al., 2009). However, there is a failure to realize the estimated financial impact of nursing care related to prevention strategies to reduce and mitigate patient harm. The health care industry is confronted with regulatory complexities that require an understanding of successful outcomes
measures, including quantitative methods to produce metrics for factual and reliable data (Valdez, 2019). The goal of comparing, measuring, and disseminating health care outcomes is to achieve the quadruple aim of health care, including a) improving the patient care experience, b) improving the health of populations, c) reducing the per capita cost of health care, and d) reducing clinician and staff burnout (Tinker, 2018).

Currently, nurse innovators do not have a system in place to meaningfully express the value and impact of their work, resulting in a lack of recognition and the invisibility of nursing innovation within the United States healthcare system. Creating retrievable, sharable, and comparable nursing innovation outcome measures can provide organizations, health care leaders, policy makers, government officials, academics, and innovation experts in cross-industry settings the ability to understand, monitor, and evaluate the effectiveness of nursing innovation contributions.

**Innovation Outcome Measures in Academia**

American universities play a significant role in generating innovation, spending approximately $75 billion annually on research while creating approximately 1,000 spinout companies earning more than $2.9 billion in license revenues annually (Cullum Clark et al., 2020). In 2020, The Innovation Impact of U.S. Universities highlighted the innovation impact of universities around the country. Innovation impact is measured by several factors, including the dissemination of research findings in STEM fields. Some key findings in this report revealed that higher research spending predicts lower productivity in creating innovation impact, and universities in metro areas with larger immigrant populations achieved more innovation impact.
that was independent of the metro area population. The innovation impact rankings of universities are based on a weighted average method that measures the following:

**Commercialization Impact**
- Patents Issued
- Licenses
- License Income

**Entrepreneurship Impact**
- Spinout Companies
- Licenses to Spinout companies

**Research Impact**
- Paper Citations
- Patent Citations

**Teaching Impact**
- STEM Ph.D. graduates
- STEM bachelors’/masters’ graduates (Cullum Clark et al., 2020)

An outcome measure routinely used to measure the innovativeness of academic settings is patent data. A patent is a form of intellectual property that offers legal protection to the owner to prevent the making, using, or selling of the invention for a period of time in exchange for publicly disclosing the invention. The requirements for a patent include that it is novel, non-obvious, and useful (Shambaugh et al., 2017). Patents measure inventions, not innovations, which may risk overestimating the level of academic innovativeness by counting inventions that may never transform into innovations (Doroodian et al., 2014). The high cost and difficulties related to the patenting process may cause individuals to employ other methods to protect innovations, including maintaining a lead time over competitors and trade secrets (Doroodian et al., 2014). Not all innovations are patentable, thus creating an imprecise measurement of innovation capability (Becheikh et al., 2006). It is also important to note that nursing is not considered a STEM discipline; therefore, nurses are excluded from the STEM graduate metric currently used by universities to rank innovation impact.
Barr et al. (2021) examined the experience of nursing innovation in seven colleges of nursing. Four themes from the study provide a blueprint for building a strong foundation for innovation centers, including creating structures of innovation and an innovation ecosystem, capacity building and faculty development, engagement of faculty, and ongoing mentoring, support, and coaching (Barr et al., 2021). The study found six themes for the sustainability and impact of nursing innovation, including funding, ongoing engagement, leadership, interprofessional collaboration, novel partnerships and novel partnership models, and overcoming the diversity innovation paradox (Barr et al., 2021). These findings provide a roadmap for academic institutions and health care organizations to create innovation opportunities and enhance creative partnerships to solve complex problems, increase financial return on investment, and improve health care outcomes.

Presently, most undergraduate schools of nursing do not embed innovation concepts into nursing curriculum despite suggestions from several multidisciplinary and nursing organizations (Cusson et al., 2019). Several university settings employ simulation centers, innovation, and idea propulsion labs to encourage innovative practice among interprofessional students. The opportunity to foster innovation practices prior to entering the workforce is a benefit for all students and provides endless possibilities regarding interprofessional innovative and collaborative potential (Endsley, 2010). Although the use of simulation labs and other initiatives have facilitated an avenue for interprofessional education and collaboration, there is still a need for innovation education to become embedded in the structure of all health care education settings (WHO, 2013).

Competency is commonly defined as the ability to do something well. It is important that innovation is integrated into the learning experiences and training of all health care providers
(Weberg & Davidson, 2020). Innovation as a competency can be demonstrated, measured, and evaluated (White et al., 2016). Health care innovation may be strengthened by innovation competencies that assess the knowledge, skills, and abilities of innovation thinking and practice. Innovation competencies highlighted by Weberg and Davidson (2020) include knowledge, skill, and ability competencies. Knowledge competency assessment is a body of knowledge applied directly to a function which can be demonstrated by self-confidence and self-knowledge about innovation, understanding complex change innovation theories, and having a clear vision for innovation. Skill competency assessment includes an observable competence, including a psychomotor act which can be demonstrated by emphasizing big picture thinking, experimenting, and testing ideas with others. An ability competency is the competence to perform an observable behavior that results in an observable product which can be demonstrated by ensuring the availability of financial resources for innovative work, competence in translating innovation to operations and implementing new roles to address the new work identified by innovation (Weberg & Davidson, 2020). These competencies provide an assessment of innovation thinking and practice and create a baseline for nursing students and nurses to measure individual innovative growth and development.

**Innovation Outcome Measures in Industry**

The Oslo Manual is an internationally recognized methodology for collecting and using innovation statistics to inform statisticians, policy makers, and anyone interested in innovation practice (OECD, 2018). The manual includes basic innovation concepts, data collection guidelines, and classification for compiling statistically representative and internationally comparable data on innovation in the business sector (Arundel et al., 2019). The Oslo Manual
defines innovation as “a new or improved product, or process (or a combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)” (p. 60). The Oslo Manual is based on the collective work of the National Experts in Science and Technology Indicators’ (NESTI) and Eurostat’s Community Innovation Survey (CIS) task force, which involved experts from 45 countries. The manual provides eight types of activities organizations can execute in the pursuit of innovation, including research and development, engineering design and other creative works, marketing and brand equity, intellectual property, employee training, software and database development, acquisition or lease of a tangible asset, and innovation management. The manual has been endorsed by the OCED Committee for Science and Technology Policy (CSTP) and the OECD Committee for Statistics and Statistical Policy (OECD, 2018).

Successful practices in organizational innovation require strategic initiatives that drive optimization. In a survey of 2,500 global executives that focused on the examination of innovation capacity among various companies, eight essential innovation attributes emerged (de Jong et al., 2015). Companies must depict the ability to aspire, which entails viewing innovation-led growth as critical to the organization with detailed targets to reflect innovation growth. A company must choose to invest in a time-risk balanced portfolio and resources to support innovative initiatives and discover differentiated business markets and insights into emerging technologies. To foster innovation, companies must evolve by creating new business models that prove reliable profit sources while accelerating the development of innovations quickly and effectively. Finally, companies should launch innovations at the right scale, creating and
capitalizing on innovation growth by extending networks to mobilize employees to stay motivated to continually innovate (de Jong et al., 2015).

Creating a scalable and successful business should begin with knowing what to measure and how to measure it (Maurya, 2016). According to Ash Maurya, the creator of the one-page business modeling tool Lean Canvas, too often, businesses rely on progress measures such as revenue, profit, and return in investment. These measures do not accurately reflect the early stages of progress because they only track numbers that are negative or near zero. These measures may reveal that something is going wrong, but they will not reveal why (Maurya, 2016). Maurya suggested establishing a single metric: Traction, which reflects the rate at which a business model captures monetizable value from its users. Traction is different from revenue. Traction is revenue that is attributable to the previous action of key users that serve as leading indicators for the extrapolation of future business.

Developing key performance indicators (KPIs) is crucial for the ability to monitor and measure supply chain industry performance (Chae, 2009). KPIs offer overall visibility of the supply chain process while providing opportunities to identify and correct potential problems (Chae, 2009). Unlike other entities that adopt a more-is-better philosophy when it comes to KPIs, supply chain performance depends on a small amount of KPIs. Primary KPIs used in supply chain management include: forecast accuracy, inventory turnover, days of inventory, planning cycle time, and forecast versus order. Secondary source KPIs include vendor lead times and vendor fill rate. Production KPIs include materials quality, production lead time, production quality job changes, overtime capacity utilization, and daily/weekly plan keeping. Delivery KPIs include on-time shipment, on-time delivery, perfect order fulfillment, and in-stick availability.
KPIs are crucial for business development and innovation capacity within organizations.

Engineering outcome measures are found to be successful when they reflect an overall business strategy. Factors such as increasing revenue, achieving high customer satisfaction, and growing a business should be considered when evaluating the success of an outcome measure. Melanie Ziegler, an engineer who launched her own consulting firm MSZ Consulting LLC, provides insight into four outcome-based metrics that quantify the value of engineering productivity. She revealed that it is necessary to consider certain questions for each outcome. Overall questions to examine performance include the following: Are you delivering value for the customer? Are you delivering results each quarter that will grow the business? Are you mitigating risk? and Do you know the return on investment of the features you are creating? (Diggins, 2016).

An innovation scorecard is a mechanism to track and measure innovation efforts such as clinical impact, financial impact, and user satisfaction. Consideration for creating an innovation scorecard includes the reliability and validity of data sources, frequency of measurement, who will be measuring the data, and the method of measurement dissemination. The innovation scorecard can provide information for timing the scaling of an innovation and for needed readjustments to the innovation that may be necessary for increasing engagement and growth (Endsley, 2010).

**Innovation Outcome Measures in Government**

The Centers for Medicare and Medicaid Services (CMS) uses outcome measures to calculate the quality of care delivered in a hospital (Tinker, 2018). A report published in 2018
grouped CMS outcome measures into seven categories weighted by importance. The categories included a) mortality (22%), b) safety of care (22%), c) readmission (22%), d) patient experience (22%), e) effectiveness of care (4%), f) timelines of care (4%), and g) efficient use of medical imaging (4%) (CMS, 2018). An outcome taxonomy created for the Program of All-Inclusive Care for the Elderly (PACE) funded by the CMS Department of Health and Human Services included four outcome measures: 1) health status outcome measures or change in patient condition, 2) utilization outcome measures that reflect health services use, 3) instrumental outcome measures that reflect non-physiologic outcomes such as behavior change, and 4) consumer-centered outcome measures that relate to participant or caregiver satisfaction. Outcome indicators and measurement selection criteria were developed to facilitate data collection and analysis (CMS, 2005).

The Centers for Medicare and Medicaid Services innovation center was established in 2010 as part of the Affordable Care Act with a goal to transition the healthcare system to a value-based model of care (CMS Innovation Center, 2021). High spending rates and lower than acceptable care quality were drivers for Congress to recognize the need for innovation to address these disparities. Since 2010, the CMS innovation center has initiated over 50 model tests, which have reached 28 million patients and 528,000 health care providers and plans (CMS Innovation Center, 2021). A new strategy incorporated by the CMS Innovation Center includes “achieving equitable outcomes through high quality, affordable, person-centered care” (CMS, 2021, p.3). Strategic objectives of the CMS Innovation center include A) Drive Accountable Care, B) Advance Health Equity, C) Support Innovation, D) Address Affordability, and E) Partner to Achieve System Transformation (CMS, 2021). These stated objectives will provide a roadmap to
reduce program costs while improving the quality of care delivered to Medicare and Medicaid beneficiaries (CMS, 2021).

The Veterans Health Administration Innovation Ecosystem supported the Spark-Seed-Spread Investment program. The stated goals of the investment program are to identify and accelerate employee-inspired innovations (VHA, n.d.). Innovations supported by the Spark-Seed-Spread focused on improving the health care experiences for employees, veterans, caregivers, and families. The Spark-Seed-Spread is a tiered investment program based on the progression of the employee’s innovative endeavors. During the Spark stage, the program supports new concepts and ideas to develop a prototype. The Seed stage consists of support for testing and validation of prototypes for a minimum of six months. The Spread stage supports validated prototypes looking to spread their innovation into multiple units and VHA sites (VHA, n.d.).

The Department of Defense (DOD) maintained various operational measurement programs that have a range of monitoring and effectiveness approaches. Specifically, the DOD examined key performance measures related to the prevention continuum for psychological health (Denning et al., 2014). An example of measures for suicide prevention was a media campaign designed by the United States Army that incorporated structural measures, including consumer input from the target population, consistent messaging across other Army suicide prevention efforts, and consideration of the unintended effects. Process measures included timing of advertisements, target markets, number of advertisements, and cost of the program. The proximal outcomes examined a change in knowledge and attitudes about signs of suicide, such as help-seeking behaviors, the number who recognize the camping message, and the number of individuals who saw the advertisements. Distal outcomes included change in rate and type of
help-seeking for suicidal ideation, change in the rate of suicide attempts, and change in the rate of deaths by suicide (Denning et al., 2014).

In a study conducted by Whittinghill et al. (2015), active-duty Navy personnel informed on the culture of their workplace setting by taking the Perceived Organizational Culture And Innovative Climate Assessment (POCaICAT) survey. Findings from the survey indicate a correlation between an organization's perceived organizational culture and its perceived innovation climate. The data suggest that through culture modification, organizations can improve innovativeness to combat novel and complex challenges (Whittinghill et al., 2015).

**Nurse Innovator Outcomes in Health Care**

Health care organizations employ outcome measures for several reasons, including a) revealing areas in which interventions may improve care, b) identifying variations in care, c) providing evidence about interventions that work the best for certain types of patients, and d) comparing the effectiveness of various treatments and procedures (Tinker, 2018). For Magnet® recognized hospitals, which indicate nursing excellence, outcome measures such as nurse-sensitive indicators are evaluated to demonstrate quality performance and excellence in patient care delivery (Graystone, 2018). The American Nurse Credentialing Center highlights five components organizations must display to achieve magnet recognition, including transformational leadership, structural empowerment, exemplary professional practice, new knowledge innovation, and improvements and empirical outcomes (Luzinski, 2011).

A recent study examining differences between Magnet and non-Magnet designated hospitals revealed that Magnet designated hospital nurses had higher scores in knowledge, stronger perceived evidence-based cultures, and greater evidence-based practice mentoring
Magnet recognition has been associated with improved patient outcomes and workforce stability (Kutney-Lee et al., 2015). Evidence-based practice has been correlated with high-quality care, higher levels of nurse engagement, and improved patient outcomes (Kim et al., 2017; Melnyk et al., 2017). An underpinning of evidence-based practice was the process of clinical inquiry, which is a “consistently questioning attitude toward practice: an ongoing curiosity about best practices, and an inquisitiveness about the best evidence to guide clinical decision-making” (Melnyk et al., 2017, p. 11). Clinical inquiry acts as an underpinning of nursing innovation as well, in that it provides an impetus to shift from the thinking of “that’s how it’s always been done” to “what are new ways of approaching this issue.”

Omachonu and Einspruch’s (2010) conceptual framework for innovation in healthcare provides a process for examining innovation through specific domains, including quality, cost, safety, efficiency, and outcomes. These domains reflect the desire for health care systems to leverage innovative practices for the continual improvement of patient care delivery. Enhanced efficiency, improved clinical outcomes, enhanced patient experience, cost containment, increased productivity and improved patient safety require an innovative approach (Omachonu & Einspruch, 2010). Measurable outcomes related to nursing innovation practice can be examined through these domains to quantify the impact and value of nurse innovators.

Quality Outcomes

The Nurse-Family Partnership program was developed in Denver, Colorado, to support low-income, first-time mothers during pregnancy and throughout the first two years of childhood (ICN, 2009). Three randomized control trials conducted at separate times have revealed improved outcomes related to the program. Outcome measures evaluated for this innovative
An innovative initiative to improve competence with intravenous insertion in a pediatric emergency department was initiated by the nurses at Massachusetts General Hospital in Boston. The initiative, KICK It in the Pedi ED, was hoping to improve the primary preceptor’s competence in teaching IV insertion placement to new orientees to the unit (Fox & Warchal, 2019). Adult learning principles were reviewed, and a new curriculum was created for primary preceptors in a consistent manner. Preceptor surveys and patient charts were audited to determine outcomes related to the initiative, which included an increase in preceptor competence from 47.2% to 100%, an increase in IVs placed with corresponding order from 54% to 77%, and an increase in the successful first attempt of insertion from 49% to 55% (Fox & Warchal, 2019). A cost savings of $2,738 was also noted as a result of the innovative initiative (Fox & Warchal, 2019).

Examining measurable outcomes used to describe the work of nurse innovators will provide objective results that may be generalizable to larger populations and have the potential to identify interventions that maximize the quality and quantity of nursing innovation. An alternate perspective is that quantitative data related to measurable outcomes may cause reductionism, which is taking a complex phenomenon and reducing it to a small amount of numbers creating a loss of the nuance of the phenomenon (Valdez, 2019). However, reductionism may create an opportunity to study a large number of innovation exemplars to provide a connection of comparable metrics and outcomes that can be leveraged to reveal the impact of nursing
innovation (Gambatese & Hallowell, 2011). Dr. Bonnie Clipper, a published expert in nursing innovation, states:

When we go around the country and talk about innovation, nurses tend not to see themselves in that light, even though they are natural innovators. If I ask a room full of nurses whether they see themselves as innovators, just a couple of hands go up. When I reframe the question—to ask if they’ve created a work-around or MacGyvered anything to take care of their patients—all hands go up. (BDO, 2019, p. 3)

Cost-Saving Outcomes

Globally, nurses participate in innovative initiatives to improve outcomes and reduce health care expenses (Kaya et al., 2015). The United States health care spending rate is 17.8% of its gross domestic product compared to 11.5% for other high-income countries (Papanicolas et al., 2018). The Centers for Medicare and Medicaid (2018) has projected that from 2017-2026 the rate of healthcare spending will continue to grow at a rate of 5.5%. The grim financial reality of the United States healthcare system necessitates practical cost-saving solutions. Nurses are directly positioned to remove inefficiencies, improve fiscal responsibility, and become stewards of healthcare resources (Agosto et al., 2020; Kaya et al., 2015).

An innovative approach to decreasing the incidence of Catheter-Associated Urinary Tract Infections (CAUTIs) was created by an interprofessional health care team. The innovative team determined that between 21% and 55% of urinary catheters are placed in patients with no indication for catheter placement. A process called the Bladder Bundle Initiative was created that empowered nurses to discontinue a urinary catheter without a physician order if the patient no longer met the criteria for the urinary catheter. This innovative approach decreased CAUTIs by 53% over a one-year period and decreased hospital costs associated with CAUTIs, which average $700 per patient admission (Meddings, Rogers, Krein, Fakih, Olmsted, & Saint, 2014).
The Bladder Bundle initiative provides resources and expertise to other hospitals and organizations exploring CAUTI prevention programs.

Researchers at the University of Nebraska developed an innovative, collaborative practice model with the goal of improving patient outcomes and providing a lower cost of care (Guck et al., 2019). The researchers used a three-pronged approach to create the model, including staff and clinical training, patient care preparation, and care conference planning. They compared outcomes and costs related to 276 patients seen by health care providers in an ambulatory care center prior to and post-implementation of the collaborative practice model. After the implementation of the collaborative practice model, the researchers saw reductions in ER visits by 16.7%, hospitalizations by 17.7%, and total patient charges dropped from $18,491 in 2016 to $9,572 in the following year (Guck et al., 2019). Health care providers who are able to decrease costs and improve patient outcomes through innovative solutions have the potential to provide sustainability for health care systems.

The nurses at the Children’s Hospital of Philadelphia participated in an organizational goal to cut $45 million through a cost-saving nurse-led initiative called CHOPtimize (Agosto et al., 2020). Ideas to lower-cost included a thorough review of linen utilization, supply expense, supply waste, and the examination of pre-prepared kits to assess if all items are being used or routinely discarded (Agosto et al., 2020). The organization achieved more than $18 million in expense reductions during the first year of CHOPtimize. They were innovative in creating a metric that validated their effort as the percent of net revenue went from 26% to 24.5% by tracking non-labor (e.g., the cost for supplies, equipment, and services; Agosto et al., 2020).

An innovative project focused on the process in change-of-shift admissions was initiated on three units, including a pediatric surgical unit, a pediatric intermediate care unit, and a
pediatric medical unit at Methodist Children’s Hospital in San Antonio, Texas (Brown et al., 2019). The Crunch Time Protocol was adopted by all three units to streamline the admission process by having charge nurses available to receive change of shift admissions, leading to a reduction of staff overtime. This nurse-led protocol decreased overtime by 57% in the pediatric surgical unit and 21% in the pediatric intermediate care unit. This initiative resulted in an estimated $93,380 in annual fiscal impact (Brown et al., 2019).

Safety Outcomes

A medical-surgical nurse leader physician bedside rounding protocol was created in a southeastern hospital in the United States (Sturdivant et al., 2020). The rounding protocol improved patient satisfaction and nurse-physician communication within 30 days after implementation. Increased communication among interprofessional team members is directly linked to improved patient safety outcomes (The Joint Commission, 2018). This innovative initiative not only improved patient safety and Hospital Consumer Assessment of Healthcare Providers and Systems Patient satisfaction survey (HCAHPS) scores, it reduced the risk of reimbursement loss from the Centers for Medicare and Medicaid Services (Sturdivant et al., 2020).

Paul Coyne and Michael Wang invented the world’s first cognitive patient care assistant, Inspiren. Inspiren combines artificial intelligence and sensors to scan the patient room environment. A study was conducted to assess the feasibility of Inspiren to improve nursing surveillance of patients as measured by an increase in bedside report and hourly rounding to assess call light responsiveness, patient falls, and satisfaction (Sun et al., 2021). Results from the study indicated that after the implementation of Inspiren, there was a statistically significant
increase in bedside shift report and hourly rounding. Patient satisfaction surveys improved in follow-up patient surveys regarding staff response to the call light (Sun et al., 2021). Technology-assisted interventions such as Inspiren increase possibilities for remote patient surveillance, which could provide increased opportunities to promote patient safety and reduce infection exposure during the pandemic.

**Efficiency Outcomes**

A measure of nursing innovation within an organizational setting is the capacity to demonstrate innovative work behavior. Krontoft et al., (2018) examined innovation activity and bricolage, which is solving problems in real-time by using resources at hand among nurses. Bricolage is viewed as small micro-incremental steps in the innovation process (Krontoft et al., 2018). If bricolage is present in health care settings, nurses were found to have a positive association with experimentation and not being limited by a lack of resources (Baker & Nelson, 2005). Krontoft et al. surveyed 248 nurses and found that more than half of the nurses (56.1%) reported that bricolage activity occurred often or always and was the preliminary work of validating bricolage as an innovative measure in nursing.

An innovative initiative, *Don’t Make a Peep, Patients Need Sleep* at Massachusetts General Hospital in Boston, including efforts to improve the practice of nurses in the recognition and importance of reducing noise at night to ensure patients are able to sleep (Cabral et al., 2019). The project goals included determining the most common disturbances to quality sleep on an acute medical telemetry unit and changing the unit culture to include practices that promote sleep. Outcome measures included determining that roommates (26%), monitors (15%), and bed alarms (8%) accounted for 49% of noise complaints (Cabral et al., 2019). This initiative
improved the practice of approximately 95% of nurses regarding awareness of the importance of unit noise reduction (Cabral et al., 2019).

An interprofessional team at New Hanover Regional Medical Center (NHRMC) examined efforts to reduce cost by streamlining the transition of care for patients (Boykin et al., 2018). The transition of care for patients occurs when patients are discharged from the hospital into another setting. During this time of transition, patients are increasingly vulnerable to decreased care collaboration among health care providers. The NHRMC created an innovative approach and was the first health care organization to use community paramedics to conduct home visits and provide medication education, physical assessments, and medication administration (Boykin et al., 2018). Hospital pharmacists, advanced care practitioners, and paramedics collaborate to improve accessibility and post-discharge care for patients. Since the implementation of this strategic initiative, readmission rates decreased to 10.5% in 2016 compared to a readmission rate of 23.5% the previous year (Boykin et al., 2018). Through the combined efforts of hospital leadership and health care team members, this innovative approach to providing patient care after discharge has improved patient outcomes and decreased cost while providing an opportunity to improve practice and efficiency among health care professionals.

Additional Outcome Measures

Turnover may be regarded as a negative indicator in the nursing profession (Cianelli et al., 2016). This indicator may instead be viewed as an opportunity for a health care organization to employ individuals with fresh ideas, new insights, and unique approaches to solve organizational issues (Cianelli et al., 2016). Another indicator, return on investment (ROI), may not reflect the importance of innovation practice within organizational settings. Creating an
environment receptive to innovation practices will not reflect an ROI, yet it will create and improve the innovative capacity within the work environment (Cianelli et al., 2016).

The expenditures surrounding research and development (R & D) have routinely been used to measure the innovativeness of organizations. The measurement of R & D expenditures may actually overestimate the innovation capacity of an organization because the measure reflects successful as well as unsuccessful R & D initiatives (Becheikh et al., 2006). Another approach to measuring innovation is conducting an innovation count of an organization. The innovation count may be a misleading innovation indicator based on the tendency for organizations to prioritize product over process innovations. This measurement also excludes innovation failures that often provide insight into future innovation endeavors (Doroodian et al., 2014). Meaningful and relevant outcomes may fluctuate based on the stakeholders involved in the innovation process. Patients, researchers, health care providers, and insurance companies have varying perspectives and interests with regard to outcomes, including the generalizability of the findings, treatment effectiveness, improvement according to the patient’s activities of daily life, and cost-effectiveness (Louie et al., 2019).

Impeding Factors for Innovation Practice

Gender Bias

“Innovation is not gender-neutral; rather, it is gender-biased” (Nahlinder, 2010, p. 14). Although 57% of all four-year degrees are earned by women, participation in innovation is limited in that women constituted only 22% of the Science, Technology, Engineering and Math (STEM) workforce and comprise only 16% of the patents granted in the United States.
(Shambaugh et al., 2017). The United States Patent and Trade Office listing of medical innovations from 1976-2015 revealed that out of 5,639 awarded medical device patents, fewer than 5% are associated with nurses (Davis & Glasgow, 2017). Gender bias was well documented in professions of science and may influence the innovative practice in nurses. For five decades, only women could serve as nurses in the United States military (Evans, 2004). According to the Bureau of Labor Statistics (2017), men were only 10% of the nursing workforce. The decision of men to opt-out of caring professions such as nursing is a serious concern not only for women but men entering the nursing profession (Block et al., 2015).

Block et al. (2018) investigated undergraduate students and found that men’s values contributed to the perception of assigning less importance to care-oriented professions when compared to women. This study also revealed that gender differences in values caused men to perceive that care-oriented professions had relatively lower value to society and were less deserving of salary increases when compared to professions in the STEM field (Block et al., 2018). Care-oriented professions were devalued on an individual and societal level, which may lead to broader implications such as the disproportionate representation of nurses in society in general. The surveyed men and women revealed there needs to be an increase in gender balance in STEM-related fields when compared to gender equity in care-oriented professions (Block et al., 2018).

A study conducted by Nahlinder (2010) found that male-dominated occupations are more innovative than female-dominated occupations. Innovation practices linked to formal education and training on innovation are more prevalent in occupations such as engineering, manufacturing, information technology, and business. This is known as horizontal or
occupational segregation (Nahlinder, 2010). The results indicated that innovation is gender-biased and not as encouraged in professions such as nursing.

**Risk Mitigation Practices**

The health care industry is inherently a risk-averse culture. While risk-taking behavior among nurses is strongly discouraged and usually avoided (Cianelli et al., 2016), this can be detrimental to the innovation process. “Innovation requires iteration” (Edmondson, 2012, p. 10). The process of innovation requires an understanding that you will almost never get it right on the first attempt; innovation is a process of failing forward (Maxwell, 2000). Arthur Fry, an engineer at 3M™, failed at creating a super-adhesive. This failure led to the innovation of the Post-it Note™, one of the most successful innovations in recent history (Edmondson, 2012).

Nurses are faced with the enormous responsibility of finding creative ways to incorporate innovation into daily practice to ensure quality outcomes and improve patient care. Innovation involves risk-taking as well as experimentation and new ways of thinking. In order to take risks and use creative thinking strategies, nurses and other team members must feel confident that the creative approach to problem-solving is valued and supported (Snow, 2019). Allowing and encouraging innovation to flourish within organizations will give flexibility to problem-solving and build a collaborative process for innovation practice (Whittinghill et al., 2015). Health care organizations willing to modify their environment and provide resources for leadership support for innovation will enhance the potential for innovation sustainability within their organization.
Hackathons

The term hackathon originates from the word hack, known as a creative solution to a computer problem, and marathon to indicate a long-lasting process. Hackathons or Social Labs were initiated based on a desire to bring together interprofessionals with a wide variety of expertise to address challenges systematically and foster collaboration to solve problems in various arenas such as healthcare (Hassan, 2014). Nurses who are passionate about applying innovative practices to create something new can generate “explosive change for the better” (Love et al., 2021, p. 85). Hackathons usually occur over a one-day period and follow a process that includes teaming up, brainstorming, hacking, preparing a pitch, and presenting (Poncette et al., 2020). Often attendees are given the opportunity to pitch an innovative idea and collaborate with interprofessionals with skills to help develop the innovation. The small hackathon groups are tasked with the responsibility of creating the best final pitch that will be given to the larger group at the end of the day. Typically, the innovations are judged on the following criteria, including innovation potential and feasibility of the idea, execution of the idea at the hackathon, interprofessionalism of the team, user experience and design of the prototype, and presentation of the project. A recent study by Koszalinski and colleagues (2021) examined nurses' involvement in two MIT-sponsored hackathons. The findings demonstrated that participants of the hackathon viewed nurses as valuable contributors, knowledgeable, and would seek input and expertise from a nurse. Academic, industry and government settings should leverage the use of hackathons within their own environment and use the expertise from interprofessional health care providers to create solutions to organization-specific issues.
CHAPTER 3

METHODOLOGY

The purpose of this research study was to explore the value and impact of nurse innovators in academic, industry, and government settings. The study methods are described, including the study design, research questions, data collection process, data analysis process, data management process, trustworthiness, thick descriptions, human subjects’ protection, and limitations.

Design

This study used a qualitative descriptive design because it is useful when attempting to understand multifaceted experiences or processes rooted in a human context (Lincoln & Guba, 1985). This qualitative approach used interviews to tell the stories of individual experiences (Creswell & Poth, 2018). Additionally, the qualitative descriptive approach has the potential to uncover patterns within the data (Creswell & Poth, 2018). This approach provided insight into how to improve innovation practice and uncover facilitators and barriers encountered by nurse innovators. The confusion around the phenomenon of the work of nurse innovators indicates the appropriateness of a qualitative approach because nurse innovators will be examined by asking the general research question, “How is the work of nurse innovators measured in academic, governmental, and industry settings?” Currently, there is a gap in the literature on how to describe the measurement, impact, and value of nurse innovators.
Research Questions

The study answers the following questions:

1. How do nurses perceive that nursing innovation adds value to and/or impact patients or the United States healthcare system?
2. What metrics/outcome measures do nurse innovators identify as relevant and useful to evaluate innovation success?
3. What methods/resources do nurse innovators report leveraging to disseminate innovation practice, initiatives, and outcomes?

Sample

A purposive sample of 31 nurse innovators from academic, industry, and government settings were recruited to participate in this study. Etikan et al. (2016) noted that purposive sampling is best used in studies that require participants whose knowledge base is likely to provide a substantial and in-depth contribution to the intended research question. Snowball sampling was used for the recruitment of nurse innovators. Snowball sampling utilizes the approach of asking well-informed individuals to refer you to other participants for the research study (Merriam & Tisdell, 2016). Nurse innovators were recruited to participate in this study from various avenues, including Sigma Theta Tau Nursing Community, the Society of Nurse Scientists Innovators Entrepreneurs and Leaders (SONSIEL), the Johnson & Johnson Innovation Nursing Community, the American Nurses Association, the American Association of Critical-Care Nurses (AACN), and social media platforms including LinkedIn and Twitter. The following inclusion criteria were utilized:
1. Nurse innovators in an academic, government, or industry setting in the United States with a recognized history of
   a. innovation thought leadership or recognition of innovativeness
   b. published research on innovation
   c. courses taught on innovation
   d. new products/processes or patents created
2. Nurses who were English speaking
3. Nurses who were willing to be video/audiotaped
4. Nurses who were active/retired RN in the United States

Exclusion Criteria included
1. Nurse innovators not working in an academic, government, or industry setting
2. Nurse innovators outside of the United States
3. Nurses who were non-English speaking
4. Nurses without a recognized history of innovation
5. Nurses who refused to be video/audio-taped
6. Nurses who refused to give informed consent

Nurse innovators from various settings were categorized as qualified to represent those areas (academia, government, industry) only if their innovation practice originated in that setting (e.g., a nurse entrepreneur who has patented a product through her own company and who is also a professor would fall into the industry category and not academia). Industry settings could include health care settings, and government settings could include the VA healthcare system. Lincoln and Guba (1985) recommend sampling until a point of saturation or redundancy is noted. Maximum variation sampling was used to provide a wide array of variations among the sample. A wide range of nurse innovators was used to explore the diversity of innovation practice and identify important common patterns (Merriam & Tisdell, 2016). Maximum variation sampling was used to “explore the common and unique manifestations of the target phenomenon” (Sandelowski, 2000, pp. 337-338). Demographic data collected included identification of the participants work place settings. Study participants included 11 nurse innovators from academic settings, 11 nurse innovators from industry settings, and nine nurse
innovators working in government settings. In order to protect the anonymity of the study participants, no other demographic data was collected.

Data Collection

Data collection in qualitative descriptive studies focuses on discovering the who, what, and where of events or phenomena such as the work of nurse innovators (Sandelowski, 2000). All of the data were collected through semi-structured interviews by this principal investigator. A semi-structured interview guide was used to provide some structure to the interview process, and interview questions were open-ended. Interviews were guided using the responsive interview model outlined by Rubin and Rubin (2018). Open-ended probes were used to illicit more information from the participant when indicated. Pagers and phones were placed on silence to avoid interruptions. One of the primary reasons for conducting interviews is to provide an understanding of how and why certain things occur in certain environments (Yin, 2018). Interviews were scheduled for a mutually convenient time outside of the participants’ work hours. The average interview lasted approximately 40-60 minutes. Virtual interviews were conducted on the Zoom meeting platform. All interviews were digitally recorded. Field notes were written during and immediately after each interview, which included observations, initial thoughts, and any behaviors/reactions noticed during the interview process.

Data Management

Confidentiality of study participants was maintained by assigning pseudonym initials. Pseudonyms initials do not begin with the study participants’ first or last names. All field notes, digital recordings, and transcriptions were labeled with pseudonym initials. The digital
recordings were transcribed verbatim by the principal investigator. The principal investigator reviewed all transcripts for accuracy. A copy of each transcript was prepared and then emailed to the study participants within one week for review. Each participant was asked to reply to the email and confirm whether the transcript accurately reflected their interview statements. The digital recordings of the interviews were placed in a locked cabinet in the principal investigator’s home office.

Data Analysis

Following the semi-structured interviews, the PI created field notes and transcribed the audio interview recordings. Prior to data analysis, the principal investigator attended a two-day NVivo workshop through QRS International to gain an understanding and a working knowledge of the software. Data analysis began with the transcription of the audio files collected during the interview of each research study participant. Audio recordings were listened to multiple times, and transcripts were read multiple times for familiarization. Any identifying information was removed in accordance with Spencer and Ritchie’s (2014) framework. Memos were made for statements that were significant. A reflective diary was also used to reflect on thoughts related to the study. The principal investigator imported the transcripts from the digital recordings into NVivo, a qualitative analysis software platform. This stage involved open coding of transcripts in NVivo to reduce the data to broad themes. The themes were then interpreted and analyzed during multiple cycles of coding, which established an opportunity to create a transparent audit trail for themes to emerge. The themes were confirmed by an outside reviewer deemed a qualitative research expert selected by the research advisor for this study.
An inductive approach to data analysis was used guided by Ritchie and Spencer’s (1994) framework, which provided a systematic structure to analyze and identify themes. The framework is hierarchical, resembling a ladder, which Ritchie et al., (2014) chose to use as a metaphor for the framework. Each rung depicts a distinct stage of analysis. The ladder represents a continuous and iterative process in which the researcher can move backward and forward between the five stages of analysis which include 1) familiarization, 2) identifying a thematic framework, 3) indexing, 4) charting, 5) and mapping and interpretation (Ritchie et al., 2014).

The first stage, familiarization, was achieved by listening to the digital recordings, transcribing the recordings, reading, and re-reading the transcribed interview data. This stage included open coding of the transcripts to reduce the data into general broad themes using NVivo to organize the data. A node is a basic unit of data structure that represent the themes in one’s data. This stage included 1027 nodes of data. The second stage, identifying a thematic framework, was achieved by categorizing the codes identified in the first stage and re-ordering and organizing them into theme categories in a way that made sense to further the analysis of the data. This stage included reducing 1027 nodes of data from the first stage of data analysis to 77 nodes of data. The third stage, indexing, involved breaking down the restructured themes into sub-themes from the previous stage to offer a more in-depth understanding of the participants responses. Data was reduced from 77 nodes of data to 56 nodes. Memoing was used during this stage, providing a method to focus on relationships between themes. The fourth stage, charting, included moving back and forward with the data in order to provide a synthesis of the content. This involved a continuous working and re-working of the data until the main themes seemed to account for the data. This stage included reducing the data from 56 nodes to 42 nodes of data.
The fifth and final stage mapping and interpretation included revisiting the study's research questions and examining existing patterns that existed in relation to participant responses and confirming the final main themes and sub-themes with the external reviewer. It is important to note that an expert qualitative reviewer was consulted during each stage of the data analysis process and again before moving on to the next stage of data analysis.

**Trustworthiness**

Lincoln and Guba (1985) identified four criteria for establishing trustworthiness: credibility, transferability, dependability, and confirmability. Strategies to maintain credibility included recruiting an expert content reviewer to review the findings. This included reviewing the researcher’s preliminary data interpretations. The participants in the study have knowledge about innovation and the innovation process and are experts in the field related to the inclusion criteria for this study, so credibility was ensured through member checks to verify participant information and the accuracy of interview transcripts.

Transferability refers to the ability to demonstrate that the findings derived from this study can be relevant in other contexts. According to Lincoln and Guba (1985), the best way to ensure the possibility of transferability, which is the degree to which the results of the research can be generalized or transferred to other settings or contexts, is to create thick descriptions. Thick descriptions are more than details. They contextualize the data and provide a deeper understanding of the experience of the study participants (Merriam & Tisdell, 2016). According to Denzin (2001), a thick description is a narrative presented in a way that evokes the social relationships, feelings, voices, and meanings of individuals. Transferability was achieved because healthcare organizations provide common services guided by federal and local policies.
Dependability refers to the consistency in the findings and was demonstrated through the use of an audit trail, reflexivity, and reflecting on researcher bias (Cope, 2014). The audits included field notes and observations from the recorded interviews that occurred during the study.

Confirmability refers to the objectivity of the findings that emerge from the data without influence from the researcher. Cope (2014) indicated that to ensure confirmability, rich quotations from the study participants should be included to provide evidence of the themes and concepts uncovered in the research. The principal investigator created a reflexive journal, which serves as a record to examine whether decisions and approaches to the research study were influenced by biases (Lincoln & Guba, 1985). Lincoln and Guba suggested that a reflexive journal should entail: a daily schedule of the research study, a personal diary providing an opportunity for reflection on insights gained during the research study, and a methodological log of decisions made during the study. Triangulation is a technique used to analyze the results of the same study using different methods of data collection to enhance validity and to create a more in-depth picture of a research problem. The data used for triangulation in this study included the study participants' interview transcripts, field notes, and the principal investigator's reflective journal.

Human Subjects Protection

Ethical considerations were integrated into every step of the research process. First, this research was assessed by Northern Illinois University’s Internal Review Board (IRB) to ensure that ethical research practices were being followed. Informed consent was given to each participant to read and sign prior to the interviews. The consent form was in English and described the voluntary participation, approval for being recorded, study benefits, voluntary
withdrawal from the study, and contact information. To ensure privacy, interviews were conducted on a one-on-one basis in a private room. Confidentiality was maintained by ensuring that the names and other personal identification information of the participants had pseudonyms that replaced identifiable information. Data were stored on a laptop with an encrypted password to prevent access to information. The laptop will be stored in a locked cabinet in the home office of the principal investigator for a period of five years. After five years, the recordings will be destroyed by pressing the erase button on the digital recorder and using a shredder to destroy paper copies of the transcripts.

Limitations of the Study

The limitations in this study included researcher bias due to her previous experiences with nursing innovation and knowledge about nursing innovativeness in several domains. The researcher’s personal experiences related to nursing innovation may have influenced the researcher to emphasize issues previously experienced. Therefore, the researcher was careful not to let previous experiences influence her interviewing technique or analysis. A reflective journal was used to reflect on bias related to previous experiences. The use of the snowball sampling method was another limitation in this study. Because the process of snowball sampling is based on referrals from study participants rather than random selection, the representativeness of the group may be affected. Community bias was another limitation because the first participants in the study had a strong impact on subsequent participants in the sample (Maxwell & Miller, 2008).
Summary

This research study used a qualitative descriptive method to explore the measurement of nursing innovation and the impact of nursing innovation in healthcare. The study participants included 31 expert nurse innovators from academic, government, and industry settings that have insight into the impact and value of nursing innovation. The purposive sampling method led to recognized nurse innovators experts, who contributed to understanding the phenomena of nursing innovation. Data collection was accomplished through virtual interviews, and data analysis was conducted using NVIVO software for content analysis guided by Richie and Spencer’s (1994) Framework. One of the goals in conducting this research was for the researcher to become an expert in the field of innovation. The qualitative study approach provided the potential to build a nurse innovator network. Nursing innovation is an understudied phenomenon, so this study may provide significant insight for cross-industry innovation partnerships, interprofessional health care providers, government officials, healthcare leaders, educators, and future nurse innovators.
CHAPTER 4

RESEARCH FINDINGS

The purpose of this study was to explore the value and impact of nurse innovators working in academic, industry, and government settings as perceived by nurse innovators. The following research questions guided the study: 1) How do nurses perceive that nursing innovation adds value to and/or impacts patients or the United States healthcare system? 2) What metrics/outcome measures do nurse innovators identify as relevant and useful to evaluate innovation success? and 3) What methods/resources do nurse innovators report leveraging to disseminate nursing innovation practice, initiatives, and outcomes?

This qualitative descriptive study recruited a sample of 31 nurse innovators working in academic, industry, and government settings. All study participants demonstrated a recognized history of innovation, published research on innovation, courses taught on innovation, or new products, processes, or patents created. The principal investigator scheduled an initial meeting with 11 nurse innovators who requested more information regarding the purpose of the research study. Study participants were English-speaking and were employed or retired registered nurses in The United States. Study participants included 11 nurse innovators from academic settings, 11 nurse innovators from industry settings, and nine nurse innovators working in government settings. Through semi-structured virtual interviews, which included a 12-question interview guide, the researcher evoked rich, meaningful, and descriptive reflections of the participants ‘experiences.
Four main themes emerged through inductive data analysis. Theme 1: nurse innovators positively impacting their work setting environments; Theme 2: methods used by nurse innovators to measure innovative practice; Theme 3: facilitating factors of innovation used by nurse innovators; and Theme 4: barriers faced by nurse innovators. Each of these themes was further explored with subthemes that provide greater detail on the value and impact of nurse innovators. The following is a review of each theme, its subthemes, and examples of quotations to give voice to the participants in the study.

Theme 1: Nurse Innovators Positively Impacting their Work Setting Environments

Nurse innovators reported positively impacted their various work settings by intentionally using innovative practices to improve healthcare products, processes, methods of communication, patient education delivery, and outcomes. These innovations directly led to decreased rates of hospitalization, improved patient safety, decreased rates of pain, increased efficiency, and improved interdisciplinary communication. The first subtheme included nurses who were able to successfully impact their environment by building health equity through innovative practice. A second subtheme included nurses positively impacting their environment and improving patient outcomes by recognizing gaps in healthcare. Finally, the third subtheme included nurses who were able to positively impact their environment by solving healthcare problems using human-centered design.

Nurse innovators described the unique ways in which they positively impacted their practice environment. They innovated products to improve health care quality and care delivery for patients. These innovations impacted their environment by increasing safety standards and mitigating risk to patients. As KD described:
One, it can organize and secure multiple-sized intravenous (IV) lines and cords. It’s made to move with a patient, which is what the science says, that we should be moving the patient. They need to get up. Therapy is so important. If the cord or line pulls from one side, the force will hit the device, not the patient line insertion sites or cord attachment sites. It can go on to a bed rail, and it can go on a patient arm or an IV pole. It can mitigate up to three times the force of what it would take to actually pull out a central line that’s sutured. And if I pull this, it’s going nowhere. So, my innovation is about safety, improving patient outcomes, and protocols to help nurses infiltrate the product space.

Products created by nurses improved existing workflows. The nurses examined the spatial layout of their work settings and innovated by intentionally restructuring the environment to improve the proximity of resources. The existing structure and layout of workplace environments often promoted or impeded nursing practice. Nurses were able to use innovative methods to address barriers to existing workflows and improve the efficiency of daily nursing tasks. IO shared an example of workflow changes improving nurses’ efficiency:

I would say that my experience in innovation has been leading the product development for the enterprise next-gen version of the automated dispensing cabinet. Leading a number of product managers in identifying nursing specific workflows that need to be prioritized in the day-to-day use of the automated dispensing cabinet and medication inventory management safety.

Several products were innovated by nurses to enhance communication between patients and health care providers. The nurses examined internal communication capabilities and innovated to improve health care delivery through new technologies and applications. Many nurse innovators recognized that when patients have a mechanism to participate in their plan of care, improved outcomes are achieved. NH described:

So what happened was a client that I would interact within the community was hospitalized. And I was doing clinical rotation, finding my patients, and there she was. And out of the situation she said to me, we don’t have a way to communicate when we’re hospitalized….So out of that was born the APP, which has enhanced communication for patients who have difficulty communicating for whatever reason.
Patient care processes were innovated by nurses to ensure nurses’ input was represented in the patient’s plan of care. Understanding that effective patterns of communication lead to a deeper understanding of a patient’s unique health care needs, the nurses innovated to increase opportunities for interprofessional communication regarding a patient’s plan of care. Primary nursing care is one such example, as described by HN:

A nurse from Beth Israel Hospital in Boston radically changed nursing and introduced primary care nursing. Now that was a major method. That was an innovative method that disrupted everybody. The nurse is part of the team. You make rounds, you take care of this patient from admission to discharge. I think it’s contributed first and foremost to patient well-being, understanding what’s beneficial what’s not beneficial in treatment and diagnosis.

Processes were innovated by several nurse innovators to decrease the incidence of serious injury. Fewer injuries may lead to fewer hospitalizations and utilization of fewer health care resources. The nurse innovators were able to demonstrate through innovative practice that early identification of issues such as wounds directly leads to the prevention of possible surgery or amputation, as explained by PZ:

The person who has diabetes oftentimes has diabetic retinopathy in their eyes, and they can’t see that well because of that distance to their foot and back again using the mirror. It’s very difficult to see for the person with spinal cord injury, usually cannot turn their head well enough to see in the mirror. We think that we can prevent some of these wounds or catch them in the very early stages and prevent that deep injury. And the possibility of preventing an amputation or preventing having to do a flap surgery, I mean these are really serious hospitalizations, and it changes a person’s life when they develop these ulcers and wounds. My hope is to roll a whole program out across our VA for veterans with spinal cord injury that really improves the likelihood that they will not get a pressure injury.

Hospital settings and well as patients’ home environments reaped the benefit of innovations created by nurses. The home environments of patients were impacted by nurses providing new information and delivering it in a way to ensure every member of the family was involved in the plan of care. Increased access to information provides family members with increased
confidence and a sense of control when caring for family members at home. Family members were able to openly express their opinions and voice their concerns before returning to their home environment. FL shared their thoughts on the impact of their innovation on both patients and family members alike:

But my personal happiness about it and how it changed innovation was that it provided a lifeline to the patients and families and allows them to ask those difficult questions or feel comfortable with their nurse to ask those questions instead of trying to hide them or find out later when they’re at home. We are there helping them readjust their whole life on how to care for their loved one with a trach in the hospital. I think this program gives them hope.

Protocols and new models were innovated to improve the quality of health care delivery. Many nurse innovators shared that creating sustainable improvements to processes through new models and protocols is directly related to improved patient outcomes. The protocols have been implemented nationwide and have become the standard of care. The following two excerpts highlight this phenomenon:

- My sister and I created a four-tier model for systemwide sepsis implementation, and that model has been implemented across the country. (ML)

- The protocols will improve the quality of care for our patients. And as our patients get back into society, they will be better consumers of the health care system in general. (UB)

Protocols were also created by nurses to address certain factors such as pain control. Nurse innovators used alternative approaches and innovative modalities such as the use of virtual reality as a non-pharmacologic intervention for pain control. These innovative modalities positively impact the environment by addressing the downstream effects of pain, such as the national epidemic of opioid abuse. JV reflected on their innovative journey:

I was working on a ward that deals primarily with post-surgical patients, and pain control ends up being a really huge part of what we do. Right after an operation, we do a lot of orthopedic surgeries. And I was noticing, basically, right from the start that I felt like
there were other things that we could be doing to improve the outcomes of our patients who are having operations. And so, I did a little bit of research into how to improve outcomes, came across the enhanced recovery after surgery protocol and started asking some questions of our nurse educators. Maybe we should look into this protocol. And if you’re not aware of what that is, it’s about bringing in non-opioid interventions, non-pharmacological interventions, and working that into the entire operative period pre, intra, and post to improve outcomes in a safer way.

It was noted that a reduction in health care costs occurred related to nurse-led innovated models of care. As leaders in the healthcare system look for various mechanisms to reduce healthcare costs, nurses leveraged innovation capabilities to save money by reducing patients’ length of stay. Nurse-led innovations improved patient satisfaction by finding approaches to reduce the need for health care resources as nurse innovators communicated:

- And then also looking for ways to help to make systems and processes work better within our health system. I think my innovation honestly has definitely helped reduce patient length of stay, which is huge for any healthcare system trying to save money increase patient satisfaction, so I felt that was a big win. (FL)

- The most important part is that it’s improving older adults’ lives. So being able to bathe or dress or being in less pain or their mood is better. And we were able to decrease nursing home utilization. (LC)

Innovation by nurses can improve the satisfaction from other health care professionals as well. Nurses reported providing opportunities for health care professionals to engage in academic innovation studios to positively impact their environment. Innovation Studios foster interprofessional collaboration by providing a space, mentors, funding, and resources to create healthcare solutions. Interprofessional innovative practice was used as a mechanism to improve satisfaction among providers. Increased provider satisfaction was found to have a positive impact on patients, as JM exemplified:

One of the key things that people either struggle to recognize or don’t recognize is the impact of innovation on clinicians. And every once in a while, you’re going to hit a home run, where a product, service, or solution is the outcome of an innovation that ends up
having a positive impact on patients. The first way to impact patients is by helping their clinicians be more satisfied with the work that they do.

The emerging field of nursing informatics inspired the creation of networking communities that provide education on information technology. Knowledge sharing and external partnerships were noted to increase innovation outcomes. LQ described how creating an information technology community impacted and expanded nursing knowledge:

Initially, it was a community of nurses, and it was just about health Information Technology. It was just about bringing a community of nurses together to understand what health IT was, what data was, and then what innovation was. And now it has transformed into looking at new technologies. I focus more on informatics and more on nurse informaticists.

Nurses working in the academic environment also impact innovative practice. Nursing faculty who embraced innovation concepts impacted nursing students by fostering innovative mindsets. Nurses who received tools to incorporate innovation practice were able to employ innovative strategies in their workplace and impact the profession of nursing on a national level. As AM elucidates:

I’ve got student alumni that are now positioned around the country in positions that really can make some significant differences. One student is working at the Pentagon. One is working at the American Nurses Association, and others are in large healthcare systems. Another is going to be starting at the Center for Disease Control and Prevention, so they are placed in all the key places for systems change.

In addition, nursing faculty described the impact of the COVID pandemic on nursing students and the importance of faculty agility. Nursing faculty who remained flexible were better able to incorporate innovative methods into novel curriculum and design virtual clinicals. These clinicals were crucial during the COVID pandemic as hospitals were forced to deny access to nursing students. WR illuminated their experience during the time of the COVID pandemic:

A colleague called and said we are going to be offering some virtual clinicals free to schools to help get them through this lurch with COVID. I had never looked at the
program or the virtual clinicals. Within two days, I was training my first school on how to use virtual clinicals in lieu of clinical placement. The school was in Queens, New York, which was a hotbed of COVID at the time. And basically, what I learned is we can adapt. And we can innovate to meet the needs of students.

Conducting research was a mechanism used by many of these nurse innovators to demonstrate improved patient outcomes. These improved outcomes positively affect patients, families, and the health care providers caring for these patients. SA described the impact of their innovative intervention on patients with diabetes:

So, the hypothesis was that a mindfulness intervention would help to decrease diabetes distress, which would then be able to decrease other psychological barriers and improve diabetes self-care, and also feelings of well-being. What we thought early on was that a mindfulness intervention would also increase mindfulness, but we have not seen that in our work. And so that leads to a question about mechanisms. We are seeing that there is improvement diabetes distress. Why is this happening? Diabetes outcomes are improved, but changes in mindfulness does not seem to be a mechanism that mediates this. And working so that maybe it can be incorporated in standards of care for diabetes education.

Innovations created by nurses have saved the lives of their patients. Nurse innovators expressed a deep commitment to incorporating innovative methods to improve patients’ lives. These life-saving mechanisms not only improved patient outcomes but had lasting generational effects on families. ML described the ongoing effect of her innovation on a patient and family:

When a pulmonologist put an article on our back-conference table that showed a research study out of the (name of place), about six patients that they had proned and supported their chest, and pelvic area, to allow the belly to hang free, and they saw an improvement in oxygenation in patients with acute respiratory distress syndrome (ARDS). So, because we believed rightfully so that mobility was under the nursing preview that at that point, we didn’t even ask our physicians permission to prone. A group of us started proning ARDS patients on the night shift and started to see significant improvements. A CNS colleague they hadn’t used the proner at one of their hospital sites, and she paged me. And I walked her through it. This was a 40-year-old gentleman. And this was the last thing they were doing to try and save his life. This was multiple years ago, and his wife was pregnant with their first kid. And they proned him. And that was the only thing they did that made a difference. And he survived. And they became good friends. And he wrote me an email about how my innovation saved his life. And that’s, to me, that means success. And I ultimately got to meet him. He put his daughter in my lap and said she would not be in this world without you.
In summary, nurse innovators were able to differentiate several types of innovation that positively impacted their environment in a variety of ways and in a multitude of work settings. In particular, nurse innovators described making changes to products, processes, protocols, and models to improve the quality and delivery of health care. In this context, nurse innovators are driving change by intentionally using innovation as a means to build, sustain and impact patients, interprofessional health care providers, and health care environments.

**Building Health Equity through Innovative Practice**

As noted by several nurse innovators, marginalized populations often encounter insurmountable barriers to accessing health care. Examining the social determinants of the health of patients was mentioned by many nurse innovators as a means to address the disparities associated with The United States healthcare system. Nurses innovated to improve care for vulnerable populations, including patients in rural areas with limited access to care, patients with disabilities, individuals in federal custody, and health care workers struggling with mental health issues. A wide diversity of knowledge guided nurse innovators during the innovation process. Nurses employed their innovation knowledge to build health equity for patients, families, and communities. Using innovation as a mechanism to improve health care access and delivery was the main focus for several nurse innovators who provided care in rural areas, as detailed by MT:

> And we are providing SANE training in our rural and underserved communities. So, we try to let our nurses know, we get that you’re scared, we get that there’s a liability, but if you don’t do this work. No one else will. They’re not going to get this care, otherwise, and when patients who are victimized don’t receive access to trauma-informed care, such as that which you would get with a forensic nurse or sexual assault nurse examiner, they’re going to be more likely to terminate medical care altogether.
Providing resources for rural patients was a goal for several nurse innovators. Nurse innovators improved care for patients who live in remote areas by creating opportunities to participate in physical and occupational therapy from their own homes using virtual technologies. These technologies are improving access and satisfaction with new treatment modalities, as JV shared:

It may also help us reach our rural patients, that live way out there and they don’t want to drive for physical therapy. Well maybe we can just bring it to you in such a real way that you feel like you’re actually interacting with a physical therapist or occupational therapist and also gamifying the experience so that it’s a more pleasant experience for you and one that you look forward to rather than hating it.

Nurses innovated to improve awareness of health care delivery for specific patient populations, including people with disabilities. Individual life experiences drove several nurse innovators to create solutions to health problems they had personally experienced. NH, who is a faculty member, describes their unique experiences and how those experiences impacted student’s perceptions of caring for individuals with special needs:

So I don’t know if you notice, but I have a physical disability, and I rehabbed my way out of a wheelchair, with some great experts to help me get there. And so, I had this unique understanding for what it is to have a disability and to try to navigate this world with a disability. And so I began to work for the University, and I was taking students into immersion courses, if you will, for their clinical because I wanted them to understand that you can work with patients who have disabilities.

Innovation was employed as a means to address disparities among vulnerable populations by nurse innovators who worked to pass national legislation to improve health care practices.

Sustainable solutions were implemented by nurse innovators to protect the safety of children in federal custody by implementing an electronic medical record to track and coordinate care delivery. TF reflected on the experience of touring a federal facility:

I got an electronic medical record for the US-Mexico border because these kids were dying while in federal custody. You need to have a nurse in these places. I was on a tour
of a border patrol station with the doctor for the region. At that point, they didn’t have a provider at every place where people were being kept, which is just crazy. Or a nurse, or a tech, they had no healthcare person. And so, I’m watching them do an assessment, and they’re basically charting on a post-it notes as if that post-it note was supposed to stay with that person as they were transferred from facility to facility.

The social determinants of health were addressed by nurse innovators who positively impacted the cost of health care through innovation. The lack of economic resources is a barrier for patients that nurse innovators were able to address through innovative practice. The issue of medication compliance was highlighted by GE as a factor directly related to the lack of financial resources:

So, for example, a patient who just stops taking his medication in the traditional world, the nurses would sit the patient down, and they would go over for the 85th time. What does this medication do? And when should you take it? and go through all of that. But suppose the root cause of it is that he can’t afford the medication, and he is too proud to tell you. So we’ve learned that you have got to get way underneath this, to figure out what’s the root cause. Organizations had to figure out how do you keep people out of the hospital? How do you keep people healthier? The work that we have done to really try to get underneath the issues of what’s the support that people need?

Innovation was used as a tool by nurse innovators to address burnout, mental health issues, and high rates of suicide among health care providers. Several nurse innovators demonstrated an inquisitiveness and passion for improving the mental health and well-being of colleagues. The importance of self-care practices among health care providers was expressed by RD, who is a champion of resilience training for nurses:

Why is resilience training important? Why is self-care important? Why is it better to decrease your productivity for your nurses so that they don’t burn out so that they don’t die by suicide so that they don’t leave the profession? And so, at that level, innovation is advocacy. I just co-published a book on self-care, so looking at innovation as how do we bring this forward and lift it.

Increased representation for vulnerable populations was echoed by nurse innovators and viewed as a top priority for innovation practice. Nurse innovators shared a vision of contributing to
society by advocating for others through innovation practice. NH shared their motivation for making a difference:

Now we talk about design justice, so how are we going to affect vulnerable populations, marginalized populations, how are we going to better represent them? For example, I just won a grant. And it’s starting in the community. This project I’m going to work on is starting in the community, including the religious community. I want to know what they need? Rather than again saying this is what needs to happen. I look at who persists in our space? Who persists in our world? And presses through, and is always seeking improvement in person-process care.

**Improving Outcomes by Recognizing Gaps in Healthcare**

Nurse innovators improved outcomes by recognizing existing gaps in healthcare. Nurse innovators recognized the existing gaps as barriers for patients that result in negative outcomes for patients. Several nurse innovators expressed how they learned to intentionally look for gaps and leverage those gaps as opportunities for innovation. FY described a gap in the Emergency Room:

I went back in the Emergency Room, and I just kind of looked for gaps. You look for spaces; you look for open areas that are not necessarily being filled that may help the system. And so what I did was I looked around, and as I worked, I noted that the one place that there was a large gap was after we lose a patient in healthcare. I noted that and created a process to fill that gap. And it was a practice that was implemented after a patient dies and recognizing that we were not taking the time to really process that. It’s just the first act of long line of many acts that need to happen in order to heal in the work that we do.

Gaps in health care led nurse innovators to improve outcomes for their colleagues. A common aim for nurse innovators was to improve gaps that directly affected them so others would not have to experience the same frustration. The shared experience of being on the front-lines prompted RA to create education on personal protective equipment:

And I think that’s probably the biggest thing that I’ve been able to do is recognize that gap. And I guess I recognize it as a nurse on a floor, on a med-surg floor, and in my work
in oncology. And recognizing this gap of I’m being told to wear this gear or isolate for a patient. I think there were things we didn’t understand about why we were garbing up for that as well. I felt like that was a hole for me, and my innovation was trying to fill that hole for people. And give them better educational products to deal with things that aren’t normal. I think because you are on the front lines 24/7, you are able to identify those gaps and do your best to fill them.

Patient outcomes improved by nurse innovators who recognized gaps at several stages. A compliance gap was noted by several nurse innovators. Instead of examining the lack of compliance as a problem with patient follow-through, nurses examined compliance as a process issue and created a space for behavioral changes to occur. Nurse innovators shared the ability to recognize gaps that exist within their work environment and adapted their frame of mind by pivoting to new and improved processes. As WR shared:

And then people who are in those companies will kind of understand where these medical gaps are, and then, of course, nursing will come in to fill the gaps. I remember very clearly, there were a lot of outpatient mental health patients at the VA that were on Prolixin, which is an intramuscular antipsychotic. And patients were coming in, they were getting a shot, and they were going home. And they would come back two weeks later to get their shot and go home, and you were never seeing any progress or any change. I developed a Prolixin clinic, and I had another nurse who was willing to participate in it with me. And we had the Prolixin clinics that they would come in for their shot, and then we would have a half an hour group that was either an educational or a support group depending on what the people needed at the time. And we saw a whole lot more compliance. We saw a lot of behavioral changes. And compliance was the big piece that we were missing. If it was just about coming in to get the shot, it was easy to skip it or forget about it or whatever. But it was that personal contact that was the motivator.

Systemwide gaps were recognized by nurse innovators who leveraged innovation capabilities to address issues such as short staffing of nurses in the hospital setting. Nurse innovators consistently recognized gaps and provided an avenue for nurses to have a better work-life balance while meeting the needs for staffing by their employer. Innovating for short-staffing was a process clarified by BQ:
And we were struggling with short staffing mandatory overtime. The union gave us these cards and said, don’t mandate us, and it didn’t really work. So, we worked with nurse staffing agencies to get back up care because we didn’t have our own internal pool that was strong. And there was no real success as far as getting last-minute coverage, so we formed our company which was primarily, at least from the start, an on-demand organization of nurses that can pick up shifts per diem nature but also at the last minute. But you know us and others are allowing nurses to have a more fulfilling work-life balance.

Nursing staffing shortages were also recognized as a factor related to issues with nursing retention. A recognized gap realized by EU was that the experience of the graduate nurse had not been evaluated or documented:

There was about a 30 to 60% turnover rate for graduate nurses. And we had a looming nursing shortage, which is very similar to today’s environment. I knew we needed to retain these nurses. We were training them at the bedside and then graduating, hiring them back at the hospital, and then have them leave. I did have this wonderful mentor who encouraged me to document and measure the graduate nursing experience.

Nursing staffing shortages during the COVID pandemic were discussed by several nurse innovators. A shared belief was that the pandemic created an opportunity for innovation to occur. Nurse innovators were able to effectively leverage the unique skill set of nurses and rapidly deploy nurses to areas in most need. CM recounted their experience during the COVID pandemic:

I think the most recent example with our company was that we were able to use a technology platform and this kind of nurse-first approach that hadn’t been done before in the area of staffing. We were able to get 200 nurses on airplanes in a matter of two or three days at the start of the crisis to go help out in New York with COVID-19.

The need for innovation to fill existing gaps in healthcare coverage was recognized by nurse innovators as a way to create stronger and safer communities. A shared perspective among several nurse innovators was the ability to examine gaps through a wide lens to see multiple complexities related to a single issue. Nurse innovators were consistently future-oriented and able to conceptualize gaps at the micro, meso, and macro-levels as expressed by MT:
We’ve still have more than 50% of our counties that don’t have any level of coverage as far as it relates to sexual assault and forensic nurses. Our nurses now know what to do, they feel empowered, and because of that, the patient gets better care. When the patient gets better care, they’re going to feel more supported, and when a patient feels more supported, they’re going to be more likely to be aware of and use community resources. That could lead to participating in the criminal justice system, which hopefully is going to make for safer communities. So, ultimately, I think that while we were focusing on the nurses, we really realized this is a community-based solution. It really does need to focus on community systems in general because it doesn’t just impact nursing. It impacts the entire community.

Gaps in the health care environment were recognized by nurse innovators that directly led to patient safety issues. Nurse innovators formed partnerships with those on the frontline to positively impact their environment and improve patient outcomes. Nurse innovators exhibited the ability to recognize gaps through observation and engaging stakeholders closest to the problem. GE described the journey to improve outcomes through examination of a gap in safety that consistently led to patient falls:

And I always would illustrate this when I was teaching. So here’s your neuro patient walking to the bathroom, and he’s pushing his infusion IV pump. And he gets to the border between his room and the bathroom, and there’s this little porcelain lip. But he is not strong enough to lift his IV pump over the lip, so he just pushes forward. The pump goes down he follows it down. And he’s on the floor now between the toilet and the sink. And the nursing assistants said this drives us crazy it’s so hard to extricate patients from this. So my friend got the lips removed, and the fall rate dropped. I think innovation comes from just engaging people on the front lines.

Solving Healthcare Problems Using Human Centered Design

Nurse innovators were able to solve existing health care problems in a variety of settings using a Human Centered Design. Human Centered Designs empower an individual or team to design products, services, or systems that address the core needs of the people experiencing a problem. A shared experience described by several nurse innovators is a belief that a solution to
a problem can be found. Nurse innovators shared how they conceptualized Human Centered Design:

- [Name of place] has a whole design school there, but user centered design is a set of tools that really works to put the innovator in the shoes of the person they’re trying to serve. And it’s everything from rapid brainstorming to prototyping to persona creation, but you really want to put your feet in the shoes of the person you’re trying to solve a problem with and understand it from their perspective, rather than kind of the top-down “I know what’s right I know the solution piece,” that sometimes happens when people are creating changes. (CM)

- Its basic premise is really all about solving problems. Innovation teaches you how to solve those problems using design thinking and human centered design. (DJ)

Human Centered Design was described as a means to amplify the voice of the patient and to meet their health care needs. Nurse innovators described involving patients during the design process to improve outcomes. Involving patients in the innovation process was explained by JV working with veterans:

So, it’s usually rather chaotic and not very structured, as you are trying to figure out what that solution might be. Let’s explore that further. Let’s look at it through the lens of human centered, veteran centered design and build that idea up and see where it goes. There’s a big part of innovation, in general, is human centered design. And so, that process by itself is constantly taking into account the voice of the customer, the voice of the stakeholders, and making sure that the solution that you develop is actually for them. And it’s almost helped design by them because that ensures that they’re going to use it and it’s going to be beneficial to them.

Human Centered Design was used by nurse innovators to improve health care outcomes in the patients’ home environments. Nurse innovators cited a lens or perspective that assisted their ability to use a broader frame of reference. LC shared their all-encompassing perspective:

From their pain to their movement in their house, to the meaning, they get from church and that we look at all of those levels, maybe not every single nurse does, but we are trained to be able to see all of that. So, I think that maybe I’ve contributed by widening the lens a little bit to include a person’s environment and how that affects their well-
being. Now we’re very formally adopting that through a series of using Human Centered Design.

Reframing the focus of healthcare from technology-driven innovation to person-driven innovation was an important distinction for nurse innovator practice. Nurse innovators expressed concern with the current emphasis on technology as the predominant mechanism used to solve healthcare problems. These concerns were expressed by the following RD:

My concern is that innovation, traditionally both in nursing and medicine and across the country, has been focused on technology so heavily that we lose the human-centeredness. The innovation that I work on is people-centered and people-first. I don’t think we need a lot of new technological devices. We need to figure out more clearly what we can do as humans.

The process of solving problems through innovation was discussed by nurse innovators as an anticipatory rather than a reactionary process. Nurse innovators discussed how improved patient outcomes are possible if innovation capabilities are used to anticipate patients’ unique needs. DW shared their perspective:

Nurses go to work to focus on somebody else, and then somebody else has to come in for them to focus on themselves. And so oftentimes, we get to a level of desperation. And we don’t want to get to the level of desperation. Innovation should be before the desperation. We should be anticipating what the need is, not reacting to what the need is.

Nurse innovators positively impacted their environment by intentionally engaging in innovation. Consistently, nurse innovators created health equity for patients through innovative practice, improved outcomes by recognizing gaps, and used human centered design practices to solve existing problems in health care. The impact of nurse innovators on the United States health care system was demonstrated by reducing health care costs, increasing efficiencies and health care quality, and improving workflow patterns. Patient health care outcomes have improved because of the innovative products, processes, and policies created by nurses. These
innovations have improved patient safety, addressed existing health care disparities, and enhanced the delivery and access to health care and essential resources.

Theme 2: Methods Used to Measure Innovative Practice

Nurse innovators use various methods to measure the use, efficiency, scalability, impact, and satisfaction of their innovations. Outcome measures associated with innovative initiatives provide evidence to demonstrate the value and impact of innovation practice for patients, providers, and healthcare systems. The first subtheme includes nurse innovators conducting research and using scales of measurement to demonstrate the impact of their innovative endeavors. The second subtheme explores the cost savings and financial value of innovations created by nurses. The third subtheme highlights the process of scaling out innovations through engagement, replication, and dissemination. The fourth subtheme examines the process of scaling deep, which includes nurse innovators gathering and incorporating feedback to maximize innovation outcomes.

The measurement of innovative practice is defined in many ways by nurse innovators. Because innovative practice is unique, so are the methods used to measure and describe the outcomes of an innovation. Nurse innovators working in academic settings described measurement in terms of the impact that innovation education has on nursing students. Students who are equipped with innovation knowledge are able to actively infuse innovation practice throughout their nursing career, as described by AM: “I personally don’t measure things other than rings; I would say rings of activation.”

Other nurse innovators described measurement in terms of reach and the momentum of recognition for an innovation. Nurse innovators who are able to boundary span into new spaces
create unlimited opportunities for nurses. DW describes the measurement of innovation in terms of areas of practice that were previously closed to nurses becoming open:

- It transitioned into very significant measurable outcomes when it started to gain national attention. And those doors began to open. And it was all of those steps along the way that you can measure the number of outreach of people and the audience that you’re reaching.

The measurement of innovation practice was described as bringing joy back to the bedside.

Nurses who participated in innovative initiatives were thrilled to have an outlet to express their creative ideas. Nursing engagement in bedside innovative practice was described by DJ as a mechanism to foster bedside nursing retention:

- I think for me, it is bringing joy back to the bedside. The nurses that I’ve been working with, I always ask them what do you intend to do? Let’s say this project really takes off, and it gets commercialized. And what I love about this is that they want to stay at the bedside if they have this creative outlet. So, we really need to be thinking about that because we need nurses at the bedside.

Nurse innovators described nursing involvement in innovation practice as a measure that may lead to increased community involvement, political participation, program implementation, and volunteerism. The number of nurses who see themselves as innovators was described as a metric of innovation by nurse innovators. TF defined the measurement of innovation in terms of advocacy, inclusion, and accountability:

- The result of that could be more nurses deciding to run for office. Or it could be more people volunteering to serve on advisory committees and just being involved. Being active in the space, seeing themselves, and knowing that they belong and that they are adding value. It’s hard to conceptualize, but that’s a culture change that I think is an important side of innovation. Passing legislation, or implementing new programs, or holding certain folks accountable, so that we are not seeing these bad practices continue.

Measuring innovative initiatives was described as a challenging process by several nurse innovators. Depending on the innovation, there may not be a way to quantify or measure an
innovation in a way that can demonstrate a desired outcome. JM reflected on the realization that individuals with an innovative mindset understand this unique challenge:

And I don’t think there’s a right answer. Measuring innovation is incredibly challenging. So, measuring the measurables and not worrying about quantifying the immeasurable. I think people with an innovation mindset, an entrepreneurial mindset, and innovation leadership background just accept the value of these things as is because they know that that’s the way the system works. Even if you can’t quantify it.

The constantly evolving nature of innovation warrants the ability for nurse innovators to be flexible and adapt. Nurse innovators described innovation measurement as the ability to realign outcomes when necessary. WR shared the importance of the continual need for outcome readjustment during the innovation process:

Setting an outcome that you anticipate but continuing to move that ball, to move that goal post, maybe closer, maybe to the right, maybe to the left, maybe further out. But to move it based on what’s happening and what that innovation looks like. One of the things with innovation is that it is constantly evolving. And if you set a goal post and don’t adapt, you are either missing it or missing another opportunity.

Using Research to Support Innovation Outcomes

Research is a process of using existing information to produce new knowledge. Nurses generate hypotheses and test them to gain understanding and share knowledge. Nurse innovators conduct research, design, and implement innovation studies to improve health care delivery, accessibility, efficiency, cost, and outcomes. Nurse innovators employed a wide variety of research methodologies to yield evidence related to their innovative endeavors.

Nurse innovators described the process of leveraging current research to inform their innovative practices and initiatives. Several nurse innovators immersed themselves in research topics related to their innovations to gain knowledge and insight. JV described conducting research during the innovation process: “So, I did a lot of research on how virtual reality is used
in healthcare and the ways in which it can be used all the different used cases and presented that along with a cost proposal.”

Participating in research studies was an avenue for many nurse innovators to begin their innovation journey. Research is used by nurse innovators as a means to investigate new medications and evaluate innovative products. IO shared their experience:

I think that I started in nursing innovation really through a research channel. I participated in a number of sponsored clinical studies in pharma, as well as resident and fellow research in high-risk maternal-fetal medicine. In the pharma case, it was an investigational agent, so something new that was being utilized in the evaluation of usually it was preterm labor. I also did a device study that was evaluating a home uterine activity monitor. All of these represent the development of a new product, in this case, to be used in the care of patients.

A pretest-posttest design is an experiment in which measurements are taken before and after an intervention or treatment. Conducting research using a pretest/posttest design was mentioned by nurse innovators as a means to ascertain if changes that occurred could be attributed to an innovation. Two nurse innovators explained their research experience:

• There were 32 nurses, and I did a pretest/ posttest control experimental design group. I put one group through and then did the pretest/posttest. And then the people that did not go through, I put them through. And no big surprise, when people are exposed to creative thinking strategies as heuristic devices to help them think about things in a new and different way, they are more creative. (XA)

• Prior to program implementation, the average length of stay was, I believe, 66 days. And then, after implementation, the average length of stay became 18 or 16 days. (FL)

Interviews were conducted by several nurse innovators as a means to fully understand the innovation process. Nurse innovators spent a long time examining the larger healthcare ecosystem to comprehend the multitude of components that influence the uptake of an innovative initiative. Interprofessional healthcare providers, industry experts, and representatives from the Food and Drug Administration (FDA) participated in innovative nursing research. KD shared
their timeline for this process: “We ended up doing 150 interviews with clinicians, not to mention the industry experts and the FDA, over the course of a couple years to really kind of map out the healthcare ecosystem.”

Focus groups were used to improve upon innovative ideas and concepts. Gathering insights and feedback during focus groups was mentioned by several nurse innovators as an important step during the design process of an innovation. PZ describes the process of using focus groups for feedback to assist the engineers working on an innovation:

And I got assigned to take on those projects because I was convenient, and I had a PhD, I knew how to run pilot studies. Little did they know that I was the right person for the job. And so, the team had a rough prototype or an idea. We [the engineers and me] ran focus groups to give feedback to the engineers to improve the designs.

Various types of research methodologies were used by nurse innovators to measure innovation outcomes. AB testing is a user experience research methodology used to compare two versions of a single variable to determine which variable is more effective. BQ described the process of incorporating AB testing into their innovative initiative: “And then, when we launch it, we usually AB test it to see the control group versus the intervention group how it’s working. And then, if it does work, we roll it out and see if we did meet the expectation of our original plans.”

A proof of concept is an exercise used to determine whether an idea can be turned into a reality. This process aids in assessing the feasibility of an idea to determine if it will function as planned. CM shared their ability to use proof of concept methodologies to help launch startup companies: “Learning about the science behind innovation there, where I helped bring startup companies into a large health system and proofs of concept and pilot testing.”

Conducting pilot studies was a mechanism shared by several nurses as a way to improve innovative initiatives. Pilot testing is a small preliminary study conducted to evaluate the
feasibility, the study design, and potential adverse events prior to a full-scale study. A Delphi study involves establishing a consensus view among subject experts to answer a research question. EU described their research process:

We had six hospitals that helped us with piloting the survey with their graduate nurses. And then we did a Delphi study, so it’s content validity index we’ve done two rounds to really perfect those questions, and we’ll revise our 2006 survey based on the Delphi studies. We will pilot it. We have probably 30 or 40 sites nationwide that want to pilot our revised survey.

A randomized controlled trial is a study design that randomly assigns participants into an experimental or control group. Nurse innovators used randomized controlled trials to examine the implementation of a healthcare model and its impact on rehospitalization rates. Results from the study revealed significant cost savings and a reduction in rehospitalizations. GE shared their thoughts on continuing to address additional populations who may benefit from the innovation:

However, if you prevent expensive rehospitalizations, you save money overall. There is a 30-50% reduction in rehospitalizations using our model and a net savings of approximately $4,500 per patient within five to twelve months after the patient was discharged….. Now we are looking at emergency department usage as well because these are expensive drivers.

Usability testing and trials were mentioned by several nurse innovators as a mechanism to vet innovative initiatives. The goal was to identify problems and determine the users’ satisfaction with the product or service. KD highlighted the process of conducting a usability trial:

And then from an outcome’s perspective. There’s something called usability trials that can actually be measured through surveys, that’s very common in the medical device industry, and it’s usually on the back end of product development. So oftentimes, the devices are made, and then a nurse hasn’t seen it, and then all of a sudden it gets to usability, and they’re like, oh, shoot, this is not designed for what we need.

Innovation may be considered the engine of scientific progress, driving the exploration and examination of new possibilities. Innovative research concentrates on creating new ideas,
analyzing problems, and identifying their origins to create new business solutions, processes, and technologies. LC described conducting research as innovating: “And really, in research, something’s always supposed to be new, the NIH [National Institutes of Health] does not fund something that already exists. So, I think in research, we’re always innovating.” Nurse innovators reflected on the barrier of getting research implemented at the bedside. Several noted a disconnect for the translation of research into health care practices and shared frustration with the inordinate amount of time it takes for the implementation of research in health care. JM reflected on this concerning phenomenon:

When you think about innovation in health care, and you think about research and healthcare, the average timeline for health care research to reach the bedside is 17 and a half years. Only 14% of health care research actually ever makes it to the bedside. So, there’s a lot of flaws within our system that make the timeline so prolonged. In my mind, a poor use of some of the brightest minds that we have if only 14% of these ideas are actually getting to the bedside.

Measuring innovation in stages was described by nurse innovators in terms of feasibility, value, efficacy, and the translation of research into practice. VO described the importance of the translation of research for the successful implementation of innovative endeavors:

I think innovation success should be measured differently over time, depending on the project. So, is it feasible at first? Can we pilot it? Does it have at least some initial value that might contribute to whether that’s improving patient outcomes which is what most of my work does, and kind of move to the next stage of that. Are we able to show efficacy? And then effectiveness over time with the innovation. And then ultimately, it needs to be translated because otherwise, it’s just research for the sake of doing research.

Nurse innovators used various scales of measurement to quantify the outcomes of their innovate initiatives. Measurement scales that are valid and reliable provided solid evidence for understanding the impact of an innovation. Usability scales were mentioned as a mechanism to observe individuals interacting with an innovation. Usability measurements are important because the measurement results help the nurse innovator understand if there are any problems
with the design of the innovation. These measurement scales are used best to inform the
innovation during the design phase of an innovation. Two nurse innovators described employing
usability metrics to help inform their innovation design:

I use the QUEST 2.0 (Quebec User Evaluation of Satisfaction with Assistive
Technology). It’s a nice, short, eight-item usability tool. And the UEQ (User Experience
Questionnaire) in our studies. (PZ)

There’s the System Usability Scale (SUS) is a very common, very validated usability
scale. And the NASA TLX scale, for example. And that actually measures cognitive
workload, as well as usability. Is this thing doing what we need it to do? Is it usable? Is
this going to work in the space that we need it to work in? (KD)

Measurement scales were used to inform topics such as post-traumatic growth,
professional quality of life, and mindfulness. Innovators discussed incorporating the
measurement scales to validate innovation efforts. Mindfulness scales were used by nurse
innovators to demonstrate improved patient outcomes. Two nurse innovators described the
importance of using pre-validated metrics:

And we’re trying to measure post-traumatic growth over time. The interventions that I’m
measuring are aspects around Post Traumatic Growth, aspects about the physiological
benefits of certain practices. So those are measures that already have designed pre-
validated metrics. It’s actually called the Post Traumatic Growth scale. I have also
worked with the Professional Quality of Life Scale. (RD)

So, in my studies, I used the FFMQ (Five Facet Mindfulness Questionnaire). The Five
Facet is interesting because it really is not a composite score. It measures the five facets
separately, so that kind of makes it a little bit difficult to work with as a measure. And I
also use the MAAS [The Mindful Attention Awareness Scale]. The MAAS measures trait
mindfulness, and so is it really not geared toward measuring changes over time. (SA)

Nurse innovators used the Patient-Reported Outcome Measurement Information System
(PROMIS) scale, which provides clinicians with reliable and valid measures of health status. The
PROMIS scale assesses physical, mental, and social well-being from the patient perspective. PZ
described the process of using the PROMIS measurement scale:
I did run a real short trial on using the PROMIS measures that are the psychological measures including anxiety, anger, and depression. Those types of things, particularly I was using those with the arm-ergometer. Because when you’re asking somebody if they really like the product or if it made them feel better, there are all these other variables that would go into their question.

Nurse innovators in industry settings that focus on nursing staffing used metrics related to how quickly the company was able to fill a vacant nursing position. Time to fill was a key performance indicator that could serve as a forecasting variable for the effectiveness of certain talent strategies. CM described the use of the time to fill metric: “There’s a couple of metrics, so one is what we call time to fill. So, how fast from the job being posted to having the right nurse, not just a warm body but the right nurse in that seat so that’d be time to fill.”

Innovations are created by nurse innovators to improve patient outcomes, such as the reduction of pain. Pain scales such as the Defense and Veterans Pain Rating Scale (DVPRS) is a graphic tool used to facilitate self-reported pain levels from patients. JV described how using the DVPRS scale demonstrated innovation impact: “If I can say that 65% of the veterans that used this had a reduction in pain of three or more points on our DVPRS pain scale, that’s a big deal.”

Nurse innovators working in academic settings used measurement to describe the uptake of their innovation thought leadership. Research studies disseminated thought platforms such as Google Scholar provided an avenue to track dissemination as described by XA:

I have a Google Scholar profile, which tracks all my citation indexes, and there is a lot now happening with bibliometrics in terms of h-index scores and citation index scores. I think those are some metrics to see how diffused it is and how people are using it.

The level of interest in innovation resources was mentioned as a metric to measure the effectiveness of thought leadership. Platforms such a ResearchGate provide statistics describing how many people are citing research and how many people are following or engaging with certain nurse innovators. LQ shared insight into measuring thought leadership:
I have a research page and account where I put my journal articles, presentations I’ve done, and chapters in my book out there. I have a research interest of 7.5. In the last year, I have over 3,500 readings. Reading can mean clicking. I don’t know if you use ResearchGate. I have put some full-text articles out there. So, that is actually one way I measure. I get stats every week. It has picked up a lot. You do that work, and finally, you find out you’re getting cited. So, I’m using technology in that way to measure the effectiveness of my thought leadership or at least if or how people are following, and listening and reading, and paying attention.

**Financial Metrics Used to Measure Innovation Initiatives**

Many metrics are used to measure the growth, success, and impact of innovation initiatives. Financial metrics are used by nurse innovators to measure the cost-effectiveness, the generation of income, and the return on investment of innovative endeavors. These financial metrics provide evidence of innovation use through sales, innovation impact, cost-savings, and innovation effectiveness through return on investment. Several nurse innovators measured the cost-effectiveness of their innovative initiatives. The ability for an innovation to save money affects patients, healthcare systems, and communities. They shared the belief that innovations may improve patient outcomes yet still need to demonstrate a cost-savings to be considered effective. LC shared the importance of how their innovation was able to save money while improving health outcomes for patients:

> It has been really important for me to look at cost as well. I thought we would be lucky if we broke even, but it turns out the program saves seven to ten times what it costs. If we hadn’t measured that, we wouldn’t know that, and we wouldn’t have so much growth. This program or other behavioral interventions are held to a higher standard that they actually have to save money rather than just improve people’s lives.

Measuring cost was noted by several nurse innovators as a means to analyze the effectiveness of an innovation. The implementation of innovative care models was associated
with added value to patients, health care providers, and the healthcare system. Collaborating with financial experts was described as imperative by GE:

And so what we did that was super innovative; we decided to measure cost. Not just are you doing a good thing? But is this model more expensive? less expensive? does it save money? What does it do? So from the very beginning, we had a health care economist at Wharton as part of our team, and he really has helped us into having a real cost analysis model.

Nurse innovators demonstrated cost-effectiveness by creating innovative avenues to maximize nursing talent. Nursing staffing shortages have created significant gaps in the delivery of quality health care. The pandemic has increased the nationwide nursing shortage, causing a strain to already limited resources. CM reflected on the ability to match specialty nurses in certain locations of need:

How cost-effective can you be by taking that talent and placing it in the right place, and not have all these extra dollars around onboarding and credentialing and travel and all those types of things so that the nurse can get paid right and the health system is not being burdened by overpriced bill rates and those types of things. For example, [name of place] has a quaternary healthcare system, their operating room does surgeries that very few people on earth do. And so, you can’t just put any Operating Room nurse there. You have to put the right OR nurse there otherwise, they have to orient that person for another eight months, and from a travel nurse perspective, that’s a premium dollar they’re spending to orient somebody that should just be able to hit the ground running.

Examining cost from a risk mitigation perspective was mentioned by nurse innovators as a means to save community financial resources. Nurse innovators proactively worked with patients in prison to help them find job opportunities upon release. UB reflected on helping transition people back into society: “We are helping and advocating for our patients, and we’re not costing money as far as litigation and lawsuits. Once again, it goes back to providing resources for returning to society and creating opportunities for our patients. It’s kind of hard to be productive members of society if you can’t work.”
Generating income based on innovative initiatives such as compassion training was a method used by nurse innovators to impact the mental health and well-being of health care professionals. Employees who participate in wellness-based activities demonstrate improved health outcomes that may lead to a reduction in burnout and employee absenteeism. RD described the importance of investing financially in wellness practices: “I would love to get compassion to the same level of the table. To say, why is compassion training important? Because we can increase hospital margins. And here’s a very specific series of data points that shows how that will actually not save you money but generate more income.”

Innovation as a revenue-generating entity was discussed by several nurse innovators who measured the sales of their innovation. Many nurse innovators stated that the validation of their product was largely determined by the number of sales as well as meeting the needs of the patients. Two nurse innovators shared the importance of yielding sales:

- It made a ton of money, millions. Money is not the only way to determine value, but it’s a really important one. Generally, the one factor that if your innovation is going to succeed, it better have some value. (HN)

- So, the ultimate thing is that it sells. That is the validation that the value proposition that we’ve been developing actually does meet the need. (KD)

Establishing value for innovative initiatives was described by many nurse innovators as essential for determining innovation impact. Nurse innovators demonstrated added value through innovative solutions to address issues such as nursing turnover. Onboarding new nurses is costly, so healthcare systems that can decrease nursing turnover rates save money on nursing orientation and the expense of paying preceptors to onboard a new employee. EU described their innovation in terms of cost savings related to a reduction in rates of turnover: “I think nurse residency programs add value because we can document a reduced turnover rate. I think it adds value to
patients in that we are reducing turnover by our programs.” Demonstrating a return on investment (ROI) was discussed as a necessary means to capture the longitudinal investment of an innovation. Nurse innovators can establish innovation value based on providing examples of financial return or return on investment. IO described the importance of measuring an innovation at many points in time:

It can also be an ROI exercise. In terms of this is the money that I spent over this period of time. Here’s the value that I’ve derived based on that money that I’ve spent, and also its snapshots in time. But it also has to reflect the longitudinal nature to show that ongoing value because hopefully, at some point, you’ve broken even and can actually show positive value.

**Scaling Out Through Engagement, Replication, and Dissemination**

Scaling innovation is the process that leads to the widespread use of an innovation to maximize the impact of the innovation. Scaling is a conscious choice used by many nurse innovators to systematically clarify, expand, and sustain their innovation. Nurse innovators typically scale an innovation after proof of concept or piloting of an innovation. Scaling out incorporates the geographical or demographical expansion of an innovation to a larger audience and encompasses moving from smaller market segments towards the mainstream market. Nurse innovators scale-out innovations through engagement, replication, and dissemination.

Nurse innovators measure the growth, use, and the engagement of innovation initiatives. Scaling out involves the process of expanding the innovation to a larger audience. Nurse innovators described how they were able to scale out their innovation by tracking user engagement and geographical growth. BQ explained this process: “So, we’ve grown our company to serving over 1000 facilities and over 20,000 nursing professionals. I think it’s 20 states now.” User engagement with innovative initiatives such as virtual clinicals were measured
to quantify innovative growth. Scaling out can be used to optimize the customization of a product to maximize impact. WR highlighted the difficulty of accurately measuring innovation growth:

For example, the virtual clinicals, we offer them for free for schools for six weeks figuring that would get them through the spring semester, and then this would all go away. And we had over 40,000 students using the virtual clinicals during that time. I look at our growth is exponential, which I think is an outcome that isn’t really measured or measurable. But I think the growth speaks volumes. I think the growth of the organization is because it is innovative, because we customize just about everything we do to meet the needs of the client.

People reaching out for more information about an innovation was described by nurse innovators as recognition of uptake. As nurse innovators engaged more in speaking about an innovation, user engagement increased. The growth of the innovation measured through user engagement was described by two nurse innovators:

- Patients asking to use it, and people reaching out and asking for it. (NH)
- I think that measurement will be engagement, it’s people asking for me to speak about it more or write about it more. (RD)

Nurse innovators described the process of tracking engagement to see who and how often the innovation is being used. Tracking innovation use was done through documentation systems and websites to determine the amount of innovation engagement. This process was described by two nurse innovators:

- We see that the nurses are utilizing the protocols by their documentation, so at least we have that aspect that we can check them, and we can say yes, our nurses are using the protocols. (UB)
- We track the number of people who use our surveys. We have a website, and we do track people. (EU)
Certain functions of user engagement can be measured, including how users engage with certain innovations. Nurse innovators described measuring churn, which is disengagement from an innovation. Examining the factors surrounding why individuals might stop using an innovative product was expressed as an important consideration related to innovation sustainability. BQ shared their ability to reflect on certain metrics related to their innovation: “How many times per day they are in the app, how often they’re utilizing the functions in a correct way, and what are the reasons when they do churn?”

Nurse innovators were able to measure user engagement in academic settings. Innovative resources in academia such as innovation studios are designated areas for nurses to engage in innovative practice. Nursing engagement in innovation studios can be used as a measure to compare with other academic institutions. JM described measuring engagement of innovative resources:

Really, we like thinking about engagement and being able to say, here’s 80 nursing students that engaged with the studio last year or something along those lines, that’s, I think, one of the really only comparable ways of comparing innovation within nursing systems and schools.

Peer engagement was described by several nurse innovators as a means to measure the uptake of an innovative process. Nurses who participate early in the adoption process of an innovation become innovation champions for diffusion. FY shared how their innovation was implemented by nursing colleagues:

Without asking, my peers implemented the practice. And they took it on, and it became part of their practice. And it’s now being practiced around the country and around the world. They don’t know my name, they don’t know my face, but they know the practice.

Patient engagement was described by several nurse innovators as a mechanism to measure the uptake of an innovation. Interprofessional engagement by the health care team was noted to be
an important factor for innovation engagement as described by GE: “We look at patient engagement. Getting patients and caregivers engaged in their health. Also, engaging members of the health care team and everyone else.”

National engagement was discussed by several nurse innovators as a milestone of recognition. When users engage with innovative endeavors on a national level, nurse innovators are viewed as experts in innovative practice. RA detailed the experience of gaining national recognition through engagement:

We had automated our system and watching hospitals from all over the country start to come in and download our materials. It was incredible when gradually you have people reach out to you from the World Health Organization and the State Department’s. And they recognize you as this person who knows more than anybody else about it.

Scaling out involves replication of an innovation to maximize innovation use. Replication was noted by several nurse innovators as a vehicle to measure innovation success. MT shared their insight into how the process of replication sparked innovation recognition within themselves: “I guess when we started really recognizing that we were on to something was when other states started doing what we were doing.” Nurse innovators noted that replication could be viewed as competitors occupying shared innovation space. Once an innovation is recognized as useful, others may choose to implement it. DJ shared their view on replication as a form of positive competition: “And then you see other organizations trying to get into the innovation space, and you think, well, is it a competition, or maybe it’s a good thing that they’re trying to copy you.”

Scaling out was described by nurse innovators working in the VA system. Nurse innovators shared their experience with replicating their innovations throughout the VA system. The replication of innovation consists of including new populations to expand innovation impact. Two nurse innovators described this process:
And so, we were able to replicate that in those nine spoke sites. We could use this in other populations than just spinal cord, we could use this in anybody with a disability. (ES)

And I got spread funding and then spread the project to Biloxi, Little Rock, Reno, and Memphis last year. So, they now all have VR programs too. I started using it with patients in the oncology infusion clinic. (JV)

Replication may involve taking an innovation and maximizing its outcomes by implementing it in a new way and with new populations. Innovation involves the flexibility to conceive alternate modalities, uses, and end-users for an innovative initiative. GE described their experience with replication: “And she started a program of research looking at that population, and what she did that was so innovative is took an idea that really someone else had successfully used but totally flipped it to a different population.”

Scaling out through the process of dissemination is used by nurse innovators as a method to promote innovative practices. Nurse innovators shared the importance of disseminating evidence and the various mechanisms used to disseminate evidence, including publications, presentations, podcasts, marketing, social media platforms, news outlets, hackathons, press conferences, talk shows, videos, textbooks, and speaking with colleagues about innovation initiatives. Disseminating innovation initiatives in publications outside of nursing was a strategy used by several nurse innovators. Exposing larger audiences outside of health care to the work of nurse innovators creates an opportunity for nurse innovators to gain innovation credibility.

Expanding dissemination practices to areas outside of health care was described by two nurse innovators:

And one of the things we’re trying to do is publish outside of nursing journals to get other people’s attention. I am writing an opinion piece now for Harvard Business Review. (DJ)

But I think some of the other ways that we have come out and told others about we’re doing is writing a thought leadership papers for industry publications in our industry. So,
McKnight’s is one of the strong long-term care or industry publications. So, we will write topics about not necessarily our business but related back into technology workforce management, scheduling, and education. (BQ)

Launching a press conference to disseminate an innovative endeavor was described by one nurse innovator as a means of dissemination and innovation recognition. Various news outlets covered DW’s innovative journey, including highlighting their impact as the most influential person of the year:

I launched a press conference. So that was introduced at a press conference that was picked up by the local papers and then the launch of the campaign. I got contacted by different producers and TV shows, and publicists, and Jonathan Silvers, who was an independent producer for ABC, decided to do a documentary, which I think went on PBS. And then, in 1998, Dan Rather had an influential person of the year like every Thanksgiving and did a whole story on me.

Nurse innovators described using various modalities for dissemination. Social media platforms offer the ability to disseminate and collaborate with a broad range of individuals. The opportunity to share and learn from fellow innovators was described by CM:

I do a lot of it through publications, social media, and books, so that’s kind of the main three drivers for me. Most recently, it’s been through podcasting and so, kind of chatting with different innovators across healthcare and learning from them and then sharing.

Engaging members of Congress in innovation initiatives created by nurse innovators was described as an important arena for dissemination. Government entities that support innovation endeavors through policy, passing legislation, and financial support are crucial for the sustainability of innovative programs. LC described their role in implementing government dissemination strategies:

I am giving an NINR (National Institute of Nursing Research) directors lecture next week. I am active on Twitter. I go to Congress; we have lobby days where we make sure that the people who are on committees that are over Medicare and also the committee’s that are on appropriations know about our program.
Sharing innovative initiatives on talk shows was mentioned as a way to reach a large and diverse audience. Nurse innovators who describe the process of creating innovation initiatives provide education for members of their community. FL described this phenomenon:

> Even just recently, I had another opportunity to talk about my innovation on a talk show because I thought it was a really interesting audience. They are not just nurses or specifically geared towards a healthcare audience. They are anyone, from mother’s, veteran’s, teachers, all different diverse groups, and it kind of dawned on me, what if someone that’s listening in that has a family member or friend that has a trach and they feel like they could use some help or some teaching.

The increase in publications highlighting the work of nurse innovators was recognized as considerable progress by several nurse innovators. Nurse innovators shared their excitement for the increase in research studies led by nurse innovators. The dissemination of research surrounding innovative initiatives was described as innovative by EU: “When we first started this work, there were not many published studies, and now there is a huge number. It’s wonderful to see that, so I think that’s really the innovation. It is publishing.”

Nurse innovators described dissemination in terms of speaking to colleagues. Sharing innovative initiatives and ideas among colleagues promotes support and recognition of innovative practice. PZ described how word of mouth is an effective mechanism for disseminating innovative endeavors: “I kind of call up my colleagues and talk to them. And that’s a really good way to do it- just really work with your colleagues and spread the word that way.”

Marketing was described by nurse innovators as a means for dissemination of a new product. Effective marketing is used often in the arena if the industry will engage and inform individuals about new products. WR shared how marketing is used for growing a company and disseminating its effects:
I present at conferences all over the place. And I think a lot of the dissemination happens as we roll out new products. We obviously market those new products. And so that’s another non-scholarly form of dissemination, but it’s what has really grown the company.

Scaling Deep to Increase Innovation Impact

Scaling deep involves the process of creating greater innovation impact by maximizing the use of an innovation. Often scaling deep is geared towards amplifying the use for the individuals that are already using the innovation. Scaling deep requires examining methods to increase engagement by understanding the end user’s mindset, culture, values, and beliefs. Many nurse innovators engaged in the process of scaling deep by obtaining end-user feedback.

End-user feedback was a means of garnering a wide range of ideas to improve innovations. Improvements to innovation were initiated when consistent feedback from many users was received. The process of incorporating end-user feedback was described by BQ:

Customer feedback, user groups. Definitely, something that we’re doing a lot with facilities and clients surveys. I guess interventions are typically really from our client feedback. And it’s, of course, it’s important not just to get one client feedback but a broad base of client feedback to make sure that you’re not just jumping on the first thing that somebody says.

Understanding the actual needs of certain populations was described as pivotal by nurse innovators for the continuation of an innovative initiative. Nurse innovators who are able to make adjustments based on end-user feedback often increase the ease of use and satisfaction with their innovation. MT highlighted this process:

We do get just a lot of feedback from the participants as far as what is it that you need? Because I think many times, they need to tell us what they need. It’s easy for us to assume what they need. But sometimes, our assumptions are not anywhere near where we think they should be going. We’ve made a lot of adjustments along the way.
Nurse innovators shared their methods for reviewing and incorporating feedback. Having regular designated intervals to review feedback was discussed as an essential phase of the innovation process. Routinely reviewing feedback was discussed as fundamental to the sustainability of their innovation. RA shared their process of reviewing feedback:

> And I would say that when we got feedback from people like folks in Texas after Ebola came to their state, that was really the kind of feedback from somebody who had already done it and walked through the process. But it allowed us to capture the squeaky wheels if there were some and figure out what was going on. And then systematically, every six months, we’d sit down and kind of look at the feedback. If you don’t look at your feedback once in a while, you don’t know if you’re really engaging people.

Nurse innovators shared that adjusting innovations based on feedback led to improved outcomes. Feedback given by patients, families, and caregivers provides a multidimensional view of innovation use, satisfaction, and impact. FL described the process of gathering feedback to better understand the level of satisfaction with their innovation:

> And the feedback we received was huge. I think that’s maybe how my innovation has changed a little bit. And then the caregiver feedback, so we did a post-discharge survey that was given at the patient’s first or second follow-up in the vent clinic. It was amazing the feedback we received from patients and families it was almost 98% were satisfied with the program, which was awesome.

Ensuring that nurses are involved in the process of providing feedback on innovation initiatives was discussed by several nurse innovators. Involving nurses at the beginning stages of innovation ideation was considered crucial for producing effective outcomes. As the hands-on providers of healthcare, nurse are perfectly positioned to inform on innovation use: “I ensure that nurses were involved in the feedback, involved in the ideation, and understood where we were going” (IO).

Stakeholder feedback can be garnered to illicit a multitude of perspectives to further an innovative initiative. Stakeholders who are engaged in an innovation and offer unique insights
for revision and improvements create an opportunity for innovation longevity. Improve outcomes based on feedback from multiple stakeholders were noted by the following innovators:

I think you have to learn who your stakeholders are as you develop your ideas in addition to your end-user. Even if it’s designed for the nurses or the healthcare system. We always love the patient’s perspective. It is so powerful, some of the things they tell you. (DJ)

So, our customers are people who access our surveys. So, students, researchers, transition to practice coordinators. The other wonderful thing is, we get lots of emails and questions. Could I change this? or I’d like to use your survey in this population. That’s how we also incorporate feedback to revise. (EU)

Feedback sessions from a single group of healthcare professionals or from interprofessional healthcare providers can be initiated to gain useful information about an innovative endeavor. Conversations among user groups provide fresh insight into the user experience. Feedback sessions may provide an atmosphere for the exchange of ideas and challenges encompassing an innovation. IO shared the importance of conducting feedback sessions:

I also like to maybe have feedback sessions where it’s a group of users, and it can be homogenous it can be different folks from different viewpoints. But sometimes, in my experience, you get really robust information from that exchange, from that conversation, from the challenges that can occur.

Collecting feedback statements from individuals using an innovation was used by several nurse innovators as a means to fully understand the user experience. Other formats of feedback were used, such as journaling and questionaries, to determine the usability and feasibility on an innovation. Incorporating multiple modalities to gain feedback was described by two nurse innovators:

So, part of what I have done in data collection over the past few years is collect qualitative statements from every veteran that we use virtual reality with. So that’s a big piece of it, so you can always have quantitative data, we have pain scores, we have stress, anxiety scores, we have all that information but to actually have the quotes from the veterans themselves about what they thought of the experience and how it affected them. (JV)
We elicited feedback from them, and we measured feedback, and we did it in several methods. It was on satisfaction questionnaires; it was through journaling, written journals, and also journaling on the App that they were able to use for home practices support. So that was a very important part of our study, especially since it was a small-scale study was to really find out satisfaction, usability, feasibility, so we were very keyed into that. (SA)

Nurse innovators leveraged user feedback as an opportunity to gain information to create future innovations. As nurse innovators experienced positive results related to their innovation, additional prospects for incorporating innovative ideas emerged. WR described the experience of integrating feedback as a mechanism to open the door to new possibilities:

The feedback I’ve gotten from schools across the country is that with the virtual simulations, students are actually doing better on their didactic tests better on their classroom tests. The feedback was very positive, and it really opened up opportunities for other things that we have moved forward with since.

Nurse innovators create mechanisms to measure the outcomes of innovative initiatives to demonstrate the value and impact of their work. Using research to promote the acquisition of new evidence to support innovative endeavors benefits patients, providers, and health care systems. Nurse innovators who track metrics including increases in efficiency, cost-savings, use, and satisfaction create value for innovative nursing practice. Scaling out through engagement, replication and dissemination provides recognition and credibility for nurses as innovators. Nurse innovators engage in the process of scaling deep to maximize innovation use by strategically garnering feedback from end-users. Nurse innovators who leverage opportunities for innovation measurement provide quantifiable data to demonstrate the impact, value, and outcomes of nurse-led innovative initiatives.
Theme 3: Facilitating Factors of Innovation

Nurse innovators discussed facilitating factors of innovation that aided their ability to innovate successfully. The factors highlighted by nurse innovators provided a mechanism to increase innovation practice, nurture an openness to new ideas, and leverage resources to strengthen the roles of nurse innovators in a variety of workplace settings. The first subtheme explores the ability of nurse innovators to embrace innovative language to facilitate their innovative practices. Nurse innovators leveraged the power of their voice to accurately reflect the value and impact of their innovative work. The second subtheme highlights the benefit of having innovative role models and mentors to demonstrate and support innovative practices. The third subtheme focuses on the furtherance of innovative work through funding and grants. The fourth subtheme examines the benefit of team and interprofessional innovation collaboration.

Leveraging Language and Voice to Support Innovative Practice

Nurse innovators shared the importance of using language that accurately reflects the value and impact of their innovative initiatives. Nurse innovators stressed the importance of carefully choosing words to effectively share innovative ideas, garner support, and disseminate innovative endeavors. Many nurse innovators reflected on the importance of using innovation language to enhance and sustain innovation practices among nurses. Nurse innovators discussed using their voice to speak up about opportunities for innovation and intentionally inserting themselves into innovative environments to promote innovation within the nursing profession.

Nurses use innovation language as a mechanism to build innovation recognition within the profession of nursing. The words surrounding innovation and the work of nurse innovators need to be understood, spoken, and shared within and outside of the nursing profession. The
uptake of innovation words and innovation language need to be infused into the profession of nursing to create a culture of recognition for nurse innovators, entrepreneurs, and intrapreneurs as shared by HN:

There were no words. Nobody used the word innovation. I didn’t even think they’d invented the word entrepreneur back in 1980 or in the 70s. I certainly couldn’t have spelled it. I had no idea. I never had a course; nobody ever talked that language. I ultimately began to learn it. Even the most basic thing “I give you permission to innovate”. And sometimes, it’s as simple as that. We don’t teach them the words. They don’t use the words, they don’t know what an entrepreneur means, they don’t know what an intrapreneur means, they can’t even define innovation.

Using language that supports innovative practice provides a means to translate the purpose, value, and impact of innovative work. If nurse innovators do not use language and words that support their innovativeness on a routine basis, it will be challenging to establish traction and validation for the sustainability of their innovation. OP shared their view on the necessity of leveraging language to sustain innovative practices: “Language is really important because in this post-modern world, if you don’t have your own language, you don’t exist.”

Quantitative language that includes objective data is extremely important in the business world. Healthcare is a business, so to gain buy-in from those in leadership, nurses need to be able to convey measurable data about their innovation, such as cost-savings, a reduction in resources, and return on investment. Two nurse innovators reflect on their experience of operating in a business environment and the necessity of using quantifiable language:

- The language of data brings value, and it’s the language that others can relate to, both within nursing and outside of nursing. (EU)

- But I think my key point here is we can’t as a profession rely upon the qualitative to articulate the quantitative value of innovation. And that’s where I’ve seen others challenged and fail in a permanent way. Because that’s not the nature of the business environment that we’re operating in and healthcare. Healthcare is an art, a science, and a business. The science can give us the quantitative from a lab perspective, but the business has to give us the numbers, the hours, the resource, efficiencies, and the
financial gains. I think that’s where success lies in terms of getting organizational leadership buy-in, but it’s something that we are not taught. And we’re not always comfortable with it, as a profession in general. (IO)

Nurse innovators discussed leveraging language to support and facilitate innovative initiatives.

The term workaround is used often in nursing, but using the term workaround was viewed as a detriment to innovative practice. Innovative aspects of the work of nurse innovators are not discussed because nurses are labeling innovation as something else, such as workarounds, and do not perceive what they are doing as innovation. HN explained that when nurses start using language that supports their innovative ideas, it will build awareness for the work of nurse innovators:

Again, because we’re never taught those words, or we don’t use the words the big boy’s use. You know we call it Jerry Rigging; we call it MacGyvering or Workarounds. We don’t call them what they are. And the guys do it. Call it innovation. Call it what it is.

Nurses typically participate in several workarounds per shift, which may result in a quick-fix rather than a lasting innovative solution. An innovative idea could impact one patient, one hospital unit, or everyone in the world, depending on the ability of nurses to transform a workaround into an innovation. Two nurse innovators reflected on the importance of applying the knowledge and skills of innovative practice to move beyond a workaround and create a greater impact:

- But nurses’ kind of learn on the job to really do that on their own, and they figure out these hacks or workarounds. And all nurses figure out these workarounds to get around things that are really hard, then they apply it to something else that could have a bigger impact. (BQ)

- And we commonly refer to those great ideas as workarounds. But those workarounds kind of go back to my answer of sharing everything with everybody is that simple workaround that that one nurse creates that could benefit patients that are being taken care of across the globe. (UB)
Leveraging nurses’ voices was discussed by nurse innovators as a facilitator of innovation practice. Innovation is dependent on nurses listening to their inner voice to create new possibilities. The innovation potential inside nurses can be awakened by garnering the courage to voice innovative ideas out loud. OP shared the connection between innovation and nurses discovering and harnessing their inner voice: “It incorporates listening to the inner voice about what might be rather than what is, so to speak.”

Nurses possess a wealth of information that, if shared, can shape and transform all aspects of healthcare. The hands-on nature of the nursing profession positions nurses to provide valuable feedback on products, processes, or workflows within the healthcare environment. DW discussed the realization that nursing feedback is essential to further innovative ideas:

That’s really a key takeaway that I never would have known if I was not involved in this or that my voice mattered. Your voice really does matter. And it’s okay to say what does not work. And I think that’s really important when you are talking about innovation and technology.

Creating support for nurse innovators by fostering an inclusive environment in which nurses feel they have the ability to speak up about innovative ideas was mentioned as a crucial component of innovation. If a nurse shares an idea and that idea is not acknowledged or supported, other nurses will be reluctant to bring their ideas forward. Supporting nurses’ voices is an innovation imperative as detailed by JV:

I’m hoping, and I have talked to a few, but I’m hoping that what I’m doing is at least helping to inspire other nurses to not feel like their voices go unheard. Nurses are typically the largest workforce in any healthcare setting, and it makes sense that we have a large voice and we are helping to govern healthcare settings. So giving them a voice and making sure they’re supported.

Acknowledging the fear that nurses have about speaking up was mentioned by several nurse innovators as an unfortunate reality that exists within many health care settings. The fear of
speaking up is often associated with a lack of understanding about how the larger healthcare
system operates and how system level decisions are made, as discussed by KD:

So, one of the themes that came up was the nurses being willing to raise their voice and
speak, particularly nurses at bedside, because that’s a big part of where my heart is. And,
I knew I was afraid to raise my voice, and in my hospital, it’s not an academic hospital or
anything, and maybe that makes a difference. I don’t know, I think it does, Magnet and
all that kind of stuff. But there was fear around raising your voice. And in the way that
we are valued in the system is a problem. If we understand our healthcare system more
from an undergrad level and how the economics work, and how health care decisions are
made, maybe our voice can be louder and make a change.

Industry leaders that position nurses in executive roles and provide platforms to amplify nurses’
voices was mentioned as a source of inspiration. Creating roles and opportunities to promote the
knowledge of nurse innovators provides innovation credibility within and outside of the nursing
profession. According to LQ, industry leaders who embrace and celebrate the voice of nurses
validate nurses as leaders of innovation:

And so when I see companies who are really embracing nursing and really giving them a
voice and giving them the space to make sales and account management decisions and
create products and be the head of VP of artificial intelligence innovation. I love that we
are coming into the space where our voices are being heard to create products and
solutions that are so well respected in big IT.

Apperception is the process of understanding something perceived in terms of a previous
experience. Nurses need to be aware of past experiences, including how they have or have not
used their voice, so future ideas can be shared. Creating the space for innovative ideas to be
revealed may require a cultural shift of openness and acceptance in healthcare environments. If
nurses’ voices are not supported, valuable innovations will never materialize, as highlighted by
ML:

It would be to give the nurse a feeling of ownership and empowerment for their thought
processes and enough energy and passion for them to see them through. Because there’s a
lot of ideas that they have that stop right at the point of telling somebody in the break room
and never go beyond that.
Innovation Role Models and Mentors

Nurse innovators discussed the importance of having an innovation role model and mentor to help nurses navigate the innovation journey. Innovative role models provide an opportunity for nurses to model innovative behavior, build a network of innovation support, collaborate, and participate in cross-industry innovation initiatives. Nurse innovators described the importance of stepping into the role of an innovation role model and mentor as pivotal to the future success of innovation practice in the profession of nursing. The concept of failing forward was mentioned as a necessary step in the innovation process. Sharing moments of innovation failure was beneficial for nurse innovators at the beginning of their innovation journey. BQ shared their insight into failure tolerance with nurses beginning their innovation journey: “And I think, maybe if I advise somebody, a young innovator, I can describe the things that we failed on before. And how you can make sure that you don’t fail versus here’s the inside secret to what we’ve done.”

Mentoring was noted as a source of inspiration. Illuminating the innovation process for nurses interested in innovative initiatives was a powerful phenomenon that several nurse innovators reflected on. They shared the perspective of creating innovation milestones and important distinctions to support their innovative endeavors. Some innovation milestones included obtaining a patent, FDA approval, and distinguishing the language used to describe an innovation. The process of creating milestones and was described by two nurse innovators:

- I had a wonderful mentor and a director who is phenomenal and very good at keeping us on track and meeting our milestones. It’s showing other nurses the power of innovation and inspiring them. (FL)

- There is a nurse who did a lot of work on Mantrum Meditation with PTSD in Southern California. She was very innovative in her work, and she made a point
saying it’s not mantra it’s mantrum. It was a distinction that she clearly made, so that was not confused with a phrase like “this is my mantra.” And so, her work was very influential, and she was a wonderful mentor. (SA)

Nursing faculty reflected on being able to mentor nursing students during unique stages of their education journey. Nursing students interested in innovative practices are fortunate to have mentors who provide education, resources, and support to help escalate an innovative idea.

Supporting nursing students through mentorship was detailed by HN:

    And I do some mentoring if there’s a student that gets identified in one of the early freshmen courses now, they have the introduction to innovation for freshmen, which counts as part of their core basic undergrad credits. That is great. I got a student referred to me by one of the professors I know to chat with, and so I chatted with her. She is a freshman with a great idea.

Nurse innovators who role model innovation practices for nursing faculty offer an opportunity for those in academic settings to understand the full potential of innovative practice. Mentoring nursing faculty promotes the uptake of innovation education by nursing students. WR shared how mentoring nursing faculty creates a large impact of the future of innovation within the nursing profession:

    And so, I was really coaching faculty across the country on how to innovate, to take this tool and innovate it to make it fit your program, to fit your level that your students are at, and to be able to help students accomplish the outcomes that are anticipated.

Innovation mentorship creates a desire for nurses to further their education. Engaging in the process of innovation provides an opportunity to expand the knowledge base of nursing. PZ reflected on how mentoring innovation practice promotes excitement and the ability to find meaning in nursing:

    Every nurse that I have mentored on the floor who has asked me to help them do a study or ask a question, formulate the question, get it out there, every single one of them has gone on to get their master’s degree. They have been motivated. Or, if they were an LPN, they were motivated to get their RN. Or if they were a two-year RN, motivated to get
their bachelor’s degree. They are so excited about their work it just changes everything. It gives meaning to their work.

Mentoring was discussed as a resource for building an entrepreneurial mindset. Innovation mentors who are focused on innovation practice provide a message of collaboration and collegiality for the innovative work. JM reflected on how their innovation mentor changed their perception of humility in regards to the success of an innovation:

So one of my mentors is the founder of a healthcare staffing company. She’s the most successful nurse entrepreneurs in the United States and lives in New Orleans, and essentially, grew a huge business and sold it. A couple years later, her management team had decided to start it back up, and she joined them again as their CEO. She is one of the top connectors of people. I think that she has a unique quality that not all innovators and entrepreneurs have, which is one of her favorite lines is, “you can get anything done if you don’t care who gets the credit.” She has done a phenomenal job of mentoring that within myself. It’s a lesson I think a lot of innovators and entrepreneurs need to hear.

The inspiration to innovate was imparted on nurse innovators by fellow healthcare professionals who embodied a quality to provide individualized care. Mentors who reflected an ability to actively listen and be present while caring for patients provided an opportunity to engage in an innovative spirit. A nursing assistant was the inspiration for RD:

The nurse innovator that inspired me was a woman who actually wasn’t a nurse, she was a nursing assistant. She is my shero. Her innovation was this deep human ability to read the room to connect with people and still get done what she needed to do.

The interprofessional nature of innovation provides an opportunity to mentor others outside the nursing profession. Interprofessional mentoring may create a shift in how those outside the profession of nursing view nurse innovators. New insights of innovation practices may be established according to PZ:

I’ve got a postdoc fellow who’s coming in for me to provide mentorship for two years. I do a lot of mentoring. I have a lot of physical therapists, occupational therapists, physicians, nurses, who I have been mentoring somewhere in their research process. That’s really exciting. I may not be in their field, but I have a lot to offer as far as process goes and how to become a successful scientist.
Nurse innovators described how role modeling innovative practice can often lead to a ripple effect of innovation. Nurses who are inspired by nurse innovators and begin to innovate will then inspire future nurse innovators. The opportunity to role model innovation and improve nursing practice was considered an innovation by ML: “And if I can inspire and influence, that way, for one nurse to just take something that I’ve talked about and make a change in their practice that benefits. I consider that an innovation.” Known leaders in the nursing profession have been the inspiration and mentors for several nurse innovators. Nursing leaders have the ability to influence innovative practice through role modeling, mentoring, and the dissemination of their innovative works. Several nurse innovators personally reflected on the nurse innovators who have influenced their trajectory:

- We’re pebbles, I think of the FAANIES (Fellows of the American Academy of Nursing). Those who have arrived and have gone through that vetting, and I look at them as those who are really changing nursing. (NH)

- It’s about models of healing from Nightingale on that move beyond natural process and incorporate nature, light, energy, food, so forth, and so on. Just go back and look at Nightingale. (OP)

Mentoring other nurse innovators provides an avenue of support, promote, and sustain innovation in nursing. Nurse innovators who mentor future innovators provide a sustainable solution for creative problem solving and new models of thinking. Mentors who share information provide an invaluable resource, as mentioned by ES:

And then the nursing innovation community, when people see one nurse innovate and how exciting it was for me. Now you present that somewhere where I was on the nursing town hall meeting, and now I’ve got people message me how do I start this? I have this question? How do I do that? and that’s great because then more and more and more and more great ideas come about.

Serving as a role model for non-traditional roles in nursing has been another mechanism that nurse innovators have leveraged to support nurses. Nurse innovators are boundary spanning
into a variety of industries and role modeling various nursing roles. Two nurse innovators shared how these non-traditional nursing roles inspire nurses who are looking to practice outside of the traditional healthcare system:

- And then also, I think, serving as a role model is something that I feel weird saying that, but I think I’m at a point in my career where, if I can serve as an example to other nurses who may be pursuing a non-traditional career path or considering it, hopefully, there’s another generation of nursing innovators behind me, that are being inspired by some of the things I’m doing. (IO)

- And to look at a nurse in a role outside of nursing was a real model for me and really inspired me to think that I could look bigger. And look outside of what I was doing, look at doing something different that’s not the standard for a nurse. And so, she was kind of a model for that. (WR)

**Financial Support through Grant and Innovation Funding**

Obtaining funds through grants and various means of financial support was a facilitating factor for nurse innovators. Nurse innovators incorporated funding to support their communities, scale their innovations, disseminate their findings, and make improvements to their innovative endeavors. Long-term sustainability for innovation was supported by having the financial support for innovation, including the space, time, and equipment to succeed. A dream for one nurse innovator was to provide financial support for innovation for nurses in hospitals: “I would love to have enough funding not to just help the staff at my hospital but help others who don’t have any formal structure within their own walls. That would be my dream” (DJ).

Nurse innovators working in academic settings shared how nursing students have accessibility to financial support through grants. A seed round is a type of financing that raises the initial capital to start a business. An A round is funding for a startup or new company that
receives funding from private equity investors or venture capitalists. The various methods of funding for innovative ideas were described by HN:

Students can easily get $4000, $5000, $10,000 as students through campus grants and programs. It means they’ve gotten their idea far enough, and it’s generally not very far because this is all an attempt to keep it going with the hope that some of them succeed. And then obviously we measure them, you know if they go farther than that trust me, we track them. If they graduate and then go do a seed round or an A round, they’re tracked and followed, and we have great success. It’s really a very exciting place. It wasn’t eight years ago. It’s amazing how far it has come in 8 years.

Financial support during multiple stages of the innovation process is incredibly important for continued success among nurse innovators. A lack of funding was discussed as a dead-end for innovation by several nurse innovators. The funding for an innovation and eventually an international licensing deal was detailed by JM, a nurse innovator working in an academic setting.

So, we said sure, here’s 250 bucks to get started. And she came back into the innovation studio because pitches are every quarter, five times a year, every half-semester. So, she came back. That was in October. She was back at the end of November, back in February, and again in April when we had her final pitch. She received four rounds of funding and kept coming back. But she kept saying, I don’t think I need more funding, but we just kept saying you never know what’s going to happen, so let’s put a little bit more in the pouch for you just in case. And that was nine months from when we had originally started the idea. That day they signed an international licensing deal, and up to that point throughout the entire process, she never spent her investment of $250 it cost $240.20, and materials to go from that idea to the international licensing deal… Innovation is really hard to measure. My thing that I think is great is I can say okay, with $200,000, we’ve funded 200 and some teams over the last couple years. At the innovation studio, we’ve now had over 400 clinicians, serving over 100 plus interprofessional teams, receive funding access and resources to get started with their ideas. So, these are, I would say, this is anecdotal, but nearly 100% of them would not have moved forward with their idea without our platform being in existence.

The American Nurse Credentialing Center (ANCC) Pathway Award provides $50,000 in funding for project proposals that contribute to a positive practice environment using innovation and technology approaches. These awards provide nurse innovators with a mechanism to further
their innovative endeavor. JV, a recipient of the pathway award, details their innovation experience of receiving the award:

I collected a lot of data over the first three or four months, and then I submitted an application to the ANCC for their pathway innovation award and received the pathway award in 2019 for my work with virtual reality with post-operative patients. And through funding sponsored by Cerner was able to spread my project from just our ward to all of the other inpatient areas, including inpatient mental health, the ICUs, and then also to our Community Living Center, which includes short-term rehab, long term care, and hospice.

The American Nurses Association (ANA) Innovation Award recognizes nurse-led innovation that improves patient safety and outcomes. The ANA innovation award provides $25,000 for an individual award and $50,000 for a team award. FL reflected on how the ANA award provides an opportunity to enhance their innovation with improved methods for dissemination:

But in order to do that, it needed to look a little bit nicer than what pieces are currently in place, such as a welcome folder, a booklet, videos, which none of them incorporate the same graphics. I really want to redo the videos as well, to make them smaller segments and easier to view in 2mins or less. So, with the help of the ANA innovation award, it will allow us to go back and redo the videos with a professional videographer.

Nurse innovators reflected on some of the intricacies of funding, including the need to include certain language to receive funding. Nurses need to understand how to navigate the funding process and strategically appeal to the needs of certain workplace settings. The process to ensure that an innovative initiative is funded was detailed by PZ:

She figured out how to develop these patient lifts, and they mandated that all hospitals had to have the patient lifts. But they didn’t want to fund it until she called it patient safety. She renamed it and restructured it, so it appeared that it was a patient safety issue versus a nurse safety issue. Isn’t that the pits?

Government funding was discussed as a mechanism to financially support innovation initiatives. Seeking out a myriad of funding opportunities was mentioned by several nurse innovators like KD as a time-intensive yet necessary undertaking to further their innovative endeavor.
So, I think our biggest supporter has been the Wisconsin Economic Development Corporation. So they’ve given us about $100,000 in grant funding, and that’s where my grants are through, and they’re not academic grants. And it takes some money. Funding, getting investment, we just got our first 100 thousand of 500 that we’re trying to raise.

The National Institutes of Health (NIH) was another source of funding used by several nurse innovators. The NIH has financially supported nurse innovators to shape policy, prevent disease, improve patient outcomes, and decrease health disparities. Two nurse innovators reflected on how the NIH has supported their innovative endeavors:

- Who knew that the NIH would fund a handyman kind of idea? (LC)
- I get funding from the NIH. And the National Institute of Nursing Research has been a huge supporter of the work that I do. They funded my Ph.D. study. They funded me when I became faculty. (VO)

Funding provided by the VA Spark Seed Spread allowed nurse innovators to scale their innovations. Scaling an innovation is a process that leads to the widespread use of an innovation.

Nurse innovators reflected on how the grant writing process has changed over the years in regard to innovation. They noted that nurse innovators need to be aware of the technology transfer component of their innovation and describe that process early in the grant application. PZ shared their discovery of the importance of having a technology transfer plan in place:

We used to wait until we were pretty much done with a product before we would start getting an industry partner, and now they are there from the very beginning. And it’s really interesting in grant applications now. There is a whole section on “tell us about your plan for technology transfer” right there at the beginning of the grant application, so they’re forcing that. Those of us that are inventors and innovators think about that from the very beginning. And I can tell you that it is a problem if you haven’t thought about it.
from the very beginning. We have run into that with a few of our devices, that there aren’t any industry partners out there that are interested in taking on a project that may be high-risk or no guarantee.

Different Perspectives from Team and Interprofessional Collaboration

Interprofessional collaboration integrates information, concepts, tools, and theories from two or more disciplines to address complex problems. Interprofessional innovation involves a group of two or more disciplines using distinct bodies of knowledge to create solutions through innovative initiatives. Engaging in an interprofessional innovation involves an openness and willingness to learn, collaborate, and share information using distinct creative processes. Interprofessional innovation engages people in understanding the complexity of problems by seeking solutions through the collective intentionality of innovation practice. Working with others to innovative was discussed by two nurse innovators:

- Innovation comes from the collective. (VO)
- I feel like innovation is very collective, collaborative work. (FL)

Intellectual curiosity was demonstrated by several nurse innovators who understood that their knowledge can always be extended and improved by the insights from those in other professions. Nurse innovators shared an intellectual flexibility to be able to change their perspective based on new information from other disciplines. Complex issues such as climate change require a breadth and depth of knowledge not obtained from a single profession as described by AM:

I read about climate change in health and the interprofessional response and bridging climate change with health which I feel is extremely innovative as well. And so, I knew I couldn’t do it alone. And began to find people in our network started networking with people that I felt we could build this. But we found climate champions people who were willing to work together and create interprofessional climate content for curriculum…..
There isn’t a field that I don’t listen to; I listen to everything that crosses my radar. No matter what area it is, it doesn’t have to be explicitly healthcare.

According to many nurse innovators, the innovation outcomes that occur from a group dynamic are fundamental to the innovation process. Successful innovations occur when there is a wide range of perspectives and diverse thinking methodologies. Demonstrating a commitment to the collaborative group process leads to the potential for better outcomes to occur according to HN:

You need to know what you need, the clinical piece that you bring, and how to build a team. Because no one is successful by themselves. When I get people pitching ideas and little companies starting to look for money, and there’s no team, I tell them to go home. Do not come back to me because you will not succeed if you keep attempting to do this by yourself. Team is like one of the most important things an investor looks for. It’s not about the idea. It’s about the experience, the team. I mean, it’s about the idea, but for me, team is a huge factor in whether or not I think someone’s going to be successful. You can have the best idea in the world and fail if you don’t have a team.

Partnering with students to participate in interprofessional practice at beginning stages of education is important for building interprofessional teamwork and collaborative practice.

Students who have the early opportunity to build interprofessional partnerships will be better equipped to collaborate in future work settings. CM reflected on the development of interprofessional team building skills and participating in collaborative efforts:

I think the last one is just being involved as the only nurse innovator on the founding faculty of a medical school that has now enrolled students who typically wouldn’t get into medical school and would-be kind of screened out of the traditional aspect and now are in there. The contribution area is building this really new way of teaching interprofessional practice where we partner with pharmacy and nursing to be able to start that collaboration on day one of the curriculum for all three schools. And so really building that teamwork in them in the beginning and we’ve had some really good feedback from the students. They haven’t graduated yet, but I think ultimately, that’s going to be a huge impact too, to the places where those people go out and practice.

Stepping outside of nursing silos and embracing interprofessional collaboration were echoed by several nurse innovators as crucial to having successful innovative outcomes. Broadly shared views of innovation concepts may lead to the formation of shared mental models.
promoting the process of innovation. IO described leveraging the knowledge from other disciplines to promote innovation initiatives:

We need to make more collaborative space and not try to solve things in a bubble. Bring in our clinician colleagues that we work with every day, bring in people from business to do the hard work of the quantifiables. I think our profession has to get on board with allowing for multiple insights, whether they be from practice, academia, associations, or industry because it takes a comprehensive and complimentary approach in innovation to get innovation off the ground, evaluated, and supported financially operationally, etc.

Collaborative innovation requires breaking down existing silos to create new opportunities for innovation growth that incorporate many diverse perspectives. Interprofessional innovative collaboration provides greater opportunities for increased innovation capacity. Early investments in interdisciplinary collaboration can have long-term positive impacts on the profession of nursing, according to several nurse innovators:

- Even though we forge our identity as nursing as a unique science, I think that innovation really relies on interdisciplinary collaboration. And I think it’s best that we don’t pigeonhole ourselves into strictly what we define as being something solely grounded in nursing science. Although that is very important, don’t get me wrong, but I feel as though we need to think outside of the box a little bit more. (SA)

- From a nursing standpoint, we need to step outside our own silos. A friend of mine collaborated on some things with an engineering group to develop a means of measuring pain. She went beyond the silo of just nursing. She went into engineering to help tap into that. (FL)

- In order for nursing innovation to grow, we also have to dream. The dream should be broad enough that it’s captured in the innovation you create. I wanted to have a reach that was far beyond myopic nursing focus to really focus on a much broader spectrum. (FY)

Exhibiting effective communication practices was noted by nurse innovators as essential to interprofessional innovation. Reducing differences in meaning by creating shared paradigms is an effective avenue to combat ambiguity regarding innovative endeavors. CM shared how
learning to work collaboratively by incorporating multiple approaches to innovation allows for knowledge integration and strategic implementation of innovation practice.

I think what we have now is we have performance improvement departments that live under quality or whatever, and we have innovation departments that live under strategy or under nobody, and they never talk. They never communicate, and they are actually like mortal enemies of each other. And so change in healthcare is fragmented and messed up, and it becomes this political game rather than really linking and thinking of changes to system competency. We need to get people in a room and actually coordinate innovation more strategically and effectively than we do now.

Opening up to the possibility of creating global conversations regarding innovation may require transdisciplinarity, which is the ability to transcend worldviews. Transdisciplinarity crosses the existing boundaries of public and private sectors by creating global innovative frameworks in order to span the existing boundaries and worldviews of innovation. DJ described the process of creating a global innovation network:

I would have enough staff so we could really build the infrastructure of innovation and document it so that others could use it as a tool or workbook or journey book to develop their own. And I would love to see this across the country and across the globe. Because I really believe if we could all be around a table, we could connect all the dots. That way, we speed up adoption and the process that helps patients rather than all of us working on the same problems all that time and in silo.

International innovative partnerships were discussed by nurse innovators as informative for comprehending various care delivery models. Collaborative international partnerships improved sustainability by bridging common interests and allowing the opportunity to combat reticence toward innovation initiatives. Several nurse innovators demonstrated how international partnerships improve innovative practice:

- We have partners in Cuba because they have a very different model of health care than we do. They actually have health care rather than illness care. They have care that’s delivered by physician nurse dyads and clinics in every single neighborhood. And so you know your physician and nurse your entire life from cradle to grave. It’s very deeply grounded in prevention and really oriented towards helping people live
well and healthy lives. So that is why I developed relationships so that we can begin to look at bringing pieces of that model back here. (AM)

- We have a network, and particularly right now in South America, where we have 13 countries who are now members. It includes countries like Peru, Colombia, Argentina, Uruguay, Panama, Costa Rica, China, Japan, South Africa, Mexico, Spain, Italy, and Portugal. The work is used in various ways around the world and certainly in the United States. (OP)

Nurse innovators described receiving pushback for moving into spaces not usually occupied by nurses where innovation routinely occurs. Breaking assumptions of what nurses can or should do relies on initiating an interprofessional dialogue to widen the lens and perception of the innovative work exhibited by nurses and nurse innovators. Sharing innovations initiated and led by nurses may lead to a shared paradigm of innovation involvement. NH described the process of boundary spanning into spaces not typically occupied by nurses:

It’s just that it’s not their world, that’s not their paradigm if you ask them, that’s not what we do as nurses. And I’ve had it said to me, stay in your lane. Whatever our lane is, I don’t know what our lane is. I think it gets us all in trouble. But, as they say, it’s good trouble. Because if nothing else, we are raising questions, and we’re pointing out to perhaps different processes. We are in infancy in nurse innovation, but I see it moving forward, and I’m really excited.

The triple helix model examines collaborative practices among individuals in academic, industry, and government settings. Interprofessional collaboration among nurse innovators in various workplace settings allowed for greater outcomes. Academic institutions supported nurse innovators by creating interprofessional innovation resources such as education programs, conferences, and cross-industry partnerships as detailed by two nurse innovators:

We have a DNP program at our university in health innovation and leadership, and that curriculum that post-baccalaureate certificate is embedded in that Doctor of Nursing Practice program. And we do a lot with the medical device center. And that all involves cross-departmental, cross-collaborations in industry. At The Planting Seeds of Innovation Conference, we bring in people who also do tech transfer, intellectual property, value proposition, business plan design, and a variety of other sorts of things. It really is a team sport. (XA)
Currently, I’m working with our tech transfer department at our university. They really take on a lot of these projects and are hoping and wanting to take on more projects for nursing. I also work with the Michigan Medicine nursing framework and departments. And then the Healthcare Innovation Impact Program (HiiP) through the School of Nursing. HiiP has helped me get in contact with tech transfer to help copyright it. (FL)

Interprofessional partnerships for innovation existing within industry were noted to be essential for nurse innovators. Nurse innovators shared how creating interprofessional partnerships in industry were beneficial to reach larger audiences, provide additional resources and support the technology transfer process. The interprofessional partnerships that occur among nurse innovators and those in industry were highlighted by several nurse innovators:

- I did do a little bit of consulting work with 3M because they were really interested in the partnership model. (AM)

- The other industry that I work with is a company called Round Glass. They developed an APP and it is free. The other industry that reached out to me was the Badge Buddies through Facebook. (FY)

- And then the people that they work with, the MADE (Minneapolis Adaptive Design and Engineering) group. Really take the original idea and the original prototypes and then move them through the iterative process of developing them, move them through the tech transfer process. (PZ)

Interprofessional partnerships with government entities were also noted as imperative for nurse innovators. Building interprofessional networks that support and drive innovative initiatives was stated as a factor for engaging individuals in innovative practice to solve complex issues. Nurse innovators were able to influence outcomes by providing needed resources, engaging multiple stakeholders, and influencing policy at the national level as stated by several nurse innovators:

- So at our University, we collaborated with our city government to host workshops where we bring the Innovation Studio to a business that has been founded by a young professional, and then talk to them about their journey to and through entrepreneurship, kind of dispelling some of the myths but also creating some new ones maybe based off of individuals experiences. (JM)
• We have a stakeholder community that we work with for the Black Maternal Health Caucus. Some insurance companies like Blue Cross, technology companies like Uber and Lyft, consumer good companies like Kimberly Clark, who make Huggies, and Medela, which is a company in our district they make the breast pumps. (TF)

• But she served, I think it was a six-year or seven-year term, on MedPAC [The Medicare Payment Advisory Commission], which is the group at the federal level that sets policies and insurance coverages for Medicare. At that level, you really influence practice and policy around the country. (GE)

The triple helix model demonstrates how innovation is supported through collaboration among academic, industry, and government entities. Nurse innovators have demonstrated interprofessional collaborations and partnerships in academic, industry, and government settings. The cross-industry partnerships will continue to provide support, resources, and recognition for the work of nurse innovators and create a working model for future interprofessional partnerships. Nurse innovators are creating a paradigm shift from defining innovation to a single institutional sphere to broader interprofessional interactions that incorporate academic, industry, and government perspectives. Nurse innovators who continue to shift between and among the various entities will foster new possibilities for future innovations.

Theme 4: Barriers to Innovation that Nurses Encounter

The fourth overarching theme represents barriers to innovation that nurses encounter. Nurse innovators from various workplace settings shared several barriers they encountered when attempting to innovate, and these were identified as sub-themes. The first sub-theme and barrier nurse innovators faced included the lack of innovation education in nursing curriculum. The second sub-theme and barrier described the lack of time to engage in innovative practice. The third sub-theme and barrier highlighted the lack of leadership support for innovation. The fourth sub-theme and barrier discussed examined the lack of knowledge regarding intellectual property
rights. The final and fifth sub-theme and barrier encountered surrounded the lack of a definition to describe the work of nurse innovators.

**Lack of Innovation Education**

The lack of innovation education was cited as a concern for many nurse innovators. Several discussed opportunities to infuse innovation into nursing education, beginning at the associate and baccalaureate levels of education. The necessity for nurturing innovation from the inception of nursing curriculum was described by TF:

I would make sure that nursing innovation is taught, encouraged, and cultivated from the very moment that someone’s nursing education begins. It should not be limited to someone who’s in a BSN program, and it should not be at the end of their BSN program. It needs to be from the very beginning that nurses are trained to see ourselves as leaders and as innovators. And those are very different skill sets, leading and innovating, and it needs to be cultivated.

A shared belief that innovation education should be infused into nursing curriculum at all levels of education was noted among nurse innovators. Nurse innovators stated the importance of allowing for the translation of innovation knowledge into clinical practice so the end results of innovation can reach patients and nurses at the bedside. This view was discussed by VO: “I would start by integrating the process of doing innovation into our educational programs, starting at the bachelor’s level and then master’s and doctorate. That has to be translated into clinical practice too.”

The inability for nurses to see themselves as innovators was associated with the lack of innovation education in nursing. Nurse innovators identified that nurses are unable to make the connection between problem-solving and innovating related to a lack of innovation knowledge. VI stated:
I wish that we had a course in graduate school or even in undergrad on nursing innovation. Teach it because nurses innovate all the time. It’s astounding when you see somebody, and they figured something out to try to solve some kind of problem at the bedside, but they don’t even know that they were innovating. They were just solving the problem. But what they did was brilliant, and there should be a way for people to kind of understand what they’re doing, understand the process and formalize what they’re doing.

Nurse innovators specified how the accrediting bodies of nursing education and the licensing examination tests for nurses need to adapt to generate future nurse innovators. Nurse innovators stated these institutions need to change to include innovation methodology to support and produce nurse innovators. HN suggested:

I would get innovation as a segment of nursing undergraduate education integrated into at least a minimum of one course or one aspect of what we teach undergraduate students. Now that means we’re going to have to have a change at the AACN level. Our NCLEX exams need to change, and they need to include questions on innovation process for it to really happen. Otherwise, it isn’t going to happen.

Innovation methodology guides innovation practice and provides a structured process for nurse innovators to follow. Without innovation education, nurse innovators identified that nurses feel lost and unable to anticipate or execute the necessary steps in the innovation process. DJ stated: “Nurses don’t understand the innovation methodology, so education is going to be huge. And the question is, when do you start that education? Can we influence nursing schools to begin some courses about this?”

The interviewed nurses found that nursing curricula does not provide students with insight into the financial or business side of healthcare. This was viewed as a barrier by many nurse innovators who felt they had to figure things out for themselves while they were innovating. Because of this lack of knowledge, preventable mistakes were made, as KD described:

Maybe getting health care economics in there before you hit the nursing curriculum because these are all things, I had to learn kind of the hard way. In nursing, we don’t
know the business side of health care, and you don’t need to know all the details, and that’s maybe not what a lot of nurses want to do. If we want to make changes to the system, and we don’t understand the system, it’s a huge barrier.

Having a course on design thinking was suggested by several nurse innovators as a mechanism that would support innovation practice and uptake. Not having a designated space in health care facilities in which nurses are able to create prototypes and develop innovation ideas was recognized as a barrier by several nurse innovators. XA stated:

I would have a research development and innovation department in every healthcare facility. I know they are making these maker spaces in a lot of different places, but I would like to have a maker space in every school of nursing. That would be amazing so that early on, people would be oriented to what innovation is what design thinking is. They would be enhancing their creative ideas, developing prototypes, and really generating all kinds of different things.

Nurse innovators who engage in teaching innovation education in schools of nursing identified several benefits, including the opportunity to expand nursing mindsets. Outcomes associated with innovation education encompassed expanding the knowledge base of innovation, the integration of innovative principals, and an opportunity to pitch ideas in order to receive funding. This process was discussed by the following two nurse innovators:

- I teach health innovation and leadership, so I think I’ve expanded the idea of what innovation is in people’s minds. (AM)

- So we decided we would start this crazy idea and would begin to try and integrate the principles and teach the principles of innovation throughout a four-year curriculum. And we started with seniors in their leadership class, and they all got as part of their major piece of their grade an innovation project that they had to work on with a team for that semester. And then we decided we’d make it fun, and the following semester, which is the spring semester before they graduated, we would hold a shark tank. A traditional shark tank and the groups would have to get up and speak. We had some judges from the business school and someone from engineering, and then others from within nursing and healthcare. I kept going around to everyone and even to the provost and saying we are going to teach innovation and entrepreneurship to undergraduate nursing students. And it was like nursing? And I said yes -nursing. Trust me, they don’t do that anymore. Nursing is one of the leaders on campus for teaching innovation. (HN)
The development of innovation nursing curricula was cited as a focus for several nurse innovators. Nurse innovators are positioned to lead innovation curriculum development because of their unique knowledge base and skill set for innovative practice. This opportunity to advance the profession of nursing was depicted by NH:

And I also want to say innovation also means innovation in teaching. I’ve had some opportunity to do some curriculum development at with some great colleagues, and again that’s innovation. Same with the other innovations that we’re working on the education piece, the curriculum revision has been very exciting to bring emancipatory perspectives into it.

Nurse innovators who are dedicated to advancing innovative practice in the profession of nursing have partnered with various entities, including the American Association of Colleges in Nursing, to establish innovation standards for nursing education. Infusing innovation education into nursing curricula will position nursing students to address the challenging healthcare needs for the future. As CM noted: “I do a fair amount of speaking about different innovations as well working really closely with the American Association of Colleges of Nursing around how to change nursing curriculum and add innovation there.”

**Lack of Time to Innovate**

The lack of time to innovate was cited by many nurse innovators as a real and often insurmountable barrier. Nurses at the bedside are known to forgo lunch breaks, and even, at times, bathroom breaks to care for patients. Finding the time to innovate while caring for patients was described by nurse innovators as an impossibility. Some nurse innovators, like ES, described this situation from the perspective of a bedside nurse:

I just feel like nurses, especially nurses on the floor, feel like they don’t have enough time. Or they don’t get the coverage for their patients so that they can participate in a
one-hour meeting, or whatever. I feel like they should be granted the time if they have an idea and truly want to work on it.

Nurse innovators described a lack of support for finding time to innovate or participate in innovative activities. Without support, they often feel isolated and alone. This isolation and lack of support was noted by JV: “Because I think you know as nurses, we stay super busy anyway. And a lot of nurses feel like they don’t have the time or they’re not going to have the support that they need in order to do this. They feel like they’re going into it alone.” Compensating nurses for their innovative ideas was described as a method to encourage innovative practice. This compensation would include conducting research to uncover findings related to innovative endeavors as suggested by one nurse innovator: “I would love to eventually buy out nurse’s time to explore and test their ideas.” (DJ).

Compensating nurses to be innovative was mentioned by several nurse innovators who stated a need for designated time to innovate during each shift. This designation for innovative time for nurses was mentioned in several ways, with multiple examples for compensation:

I would give all nurses time to be creative and time to engage in conferences and then collaborate with each other. I think we don’t give enough time for that. But I think the time, I think nurses would want that. I’ve always thought for a 10-hour shift, if you work eight hours, direct patient care, and then you had that two-hour overlap. And pay them for that 10-hour shift. Eight hours is direct patient care, and the other time is yours to use to be innovative or learn or collaborate. Just give them time. (EU)

Nurse innovators also suggested nurses should have time to participate in research and journal clubs as a means to foster innovative practice among nurses. Nurses described the reality that innovation is not included in nurses’ job descriptions and, therefore, is viewed as a luxury rather than a necessity. A suggestion of how to foster innovative practice was described by PZ as follows:
I would make sure and allow 5% to 10% of nurses time is paid to participate in research in some manner. Whether it’s joining the journal club, leading your journal club, participating in journal club, something as simple as that. It’s a shame we have way more nurses here than we have physicians. We can hardly get a nurse to be able to take a lunch hour, let alone attend an education program. We only provide enough time for them to do the mandatory things that they need to do.

The lack of time for nurses to participate in innovative work was noted, and finding a balance between work and life outside of work was found to be a top priority for nurses as described by RA:

I think one of the biggest reasons people don’t participate in scholarship as well as innovation is there just tired. There are so many elements, so many things pulling at us in nursing. Whether it’s in clinical practice or wherever I think making sure that people have that set aside that time, it’s kind of like work-life balance. You need that work-innovation balance. Having that time to really stop and say, ok, I’m really tired, but what things really matter? Like for the next generation of nurses, you have that quiet time to really think about where can you put your energy and not just continuing to put out the fires but actually put it into making things better.

Lack of Leadership Support

The lack of leadership support for nurse innovators was a common barrier in various workplace settings. The lack of support was demonstrated by an inability to be open to new ideas, a reluctance or hesitancy to incorporate innovative models or methods into nursing curriculum, and a lack of interest or support for innovative initiatives. The inability for leaders to tolerate failure was viewed as a barrier to the advancement of innovative ideas. The nurse innovators recognized that often nurses do not know what to do with an innovative idea or who to go to for support. DW shared an example of this struggle: “And again, to watch that innovation, the creativity and to watch nurses have to struggle to find their hierarchy. To figure out who it is that can help them?” Nurse innovators described incorporating leadership support for innovation by including innovation in nursing performance evaluations. This created
innovation buy-in from leadership as a standard of practice that can be consistently evaluated as
ES suggested: “I would improve nursing innovation by leadership asking nurses for their ideas
and encouraging them to pursue them. Maybe being part of their performance evaluations.”

Nursing faculty’s resistance to change was mentioned as a barrier to nursing innovation.
An example of siloed thinking practices often exhibited by nursing faculty created a barrier for
the inclusion of new ideas and new ways of thinking, as noted by WR:

Nursing faculty do not like to change, I know that’s not a newsflash, but they don’t like
to change. It was a real struggle, but I think that changed the whole landscape of our
associate degree programs in the state. Because students were able to transfer across,
faculty were able to moonlight in another school and actually know the curriculum and
know what they were doing. I would make all faculty and all nurses open to innovation
and not kind of stuck in their silos with their sacred cows. And I just talked to a school
today that they’ve implemented a whole new curriculum, only to find out that the faculty
have copied and pasted from the old curriculum into their teaching strategies. And so,
they were really not seeing the outcomes because the change didn’t occur.

A reluctance to incorporate new information was also seen as a barrier by nurse innovators to
innovative practice, models, products, processes, and research. The nurse innovators were able to
address these barriers by examining the underlying causes associated with faculty hesitancy.
Two examples follow:

- Faculty were a little reluctant to use the model because, in the olden days, not many
  people were too keen on nursing diagnosis. Older faculty do not really understand the
  significance of Nanda, NIC, and NOC. North American Nursing Diagnosis
  Association (NANDA) or the Nursing Intervention Classification system (NIC) or the
  Nursing Outcome Classification system (NOC). It was a hard sell if they did not have
  that in their philosophical worldview that standardized language is important to then
  get them to use the model. (XA)
- I’ve been unsuccessful until our new director came in, in connecting with the
  University, they really kind of rejected all e-mails from us. And I can understand
  why. Leadership is really important here. As much as I tried for a number of years, I
  could not overcome our past director and her resistance to embracing research which
  is kind of hard to imagine in this day and age. (PZ)
Nurses moving into more leadership positions was seen as a solution for several nurse innovators to gain innovation acceptance. Embracing leadership roles was seen as a direct link for nurses to embrace innovation practice. IO stated this powerfully:

I would put more nurses in more leadership positions. Because nurses have the insights of direct patient care opportunities and challenges, but in doing that, nurse have to have the philosophy that they are leaders, accept the role, be confident in accepting that role, and also be brave and uncomfortable with taking a leadership role which at times our profession steps back from. We need to own our leadership role.

Embracing the unknown was viewed as an innovative skill that nurse innovators successfully adopted. Nurse innovators shared that nurses in all positions need to cultivate a tolerance for failure and be somewhat comfortable with uncertainty and risk to innovate. The following nurse innovators highlighted ways to cultivate this tolerance:

- There were nurses I’ve met sometimes along the journey, and they are very uncomfortable with the unknown. They want to know what their borders are, and they have to know exactly what to do here and what to do there. And when you innovate, or you work for a little startup, or you do something, there are no answers. That’s what you’re there for. And if you’re uncomfortable with the unknown, then that’s not part of the innovative personality you have to find that you’re comfortable with that level of uncertainty and that that level of risk. (HN)

- I would remove the red tape or risk management. Or use the red tape to put it over the mouths of the naysayers. (MT)

The current way nurses are devalued in the healthcare system and by leadership was a barrier the nurse innovators felt directly impacted innovation practice. The nurse innovators shared frustration about how nursing practice is billed and measured. The devaluing of nurses, in general, leads to devaluing the work of nurse innovators. This reality was noted by several nurse innovators:

- Right now, nurses have always costed out as part of the room cost. It’s absolutely ridiculous. It shows that we don’t have a profession, according to the bean counters. (PZ)
• I would change the structure of nursing. I would move nursing from room charges from the same line item as bedpans to nursing care. And have metrics to measure the care that’s given that is then calculated as we do billing for physicians now. And I hate saying it because it’s not about money, but it is about money. And so, we have to play the game until the game changes. (RD)

• The way that we are valued in the system is a problem. For instance, in the hospital, we are an expense, not a revenue-generating service (like a procedure physician service). Nurses are part of the room charge, and I think this makes us less likely to be supported. (KD)

Lack of Intellectual Property Knowledge

Intellectual property consists of copyrights, patents, trademarks, and trade secrets. Intellectual property rights give individuals an exclusive right over the use of their creation for a certain period of time. Having an understanding of intellectual property rights may lead to generating more income, increased marketing options, and maintaining a competitive edge over competitors. The nurse innovators commented on the important role that intellectual property knowledge provides for the protection of innovations. Without an understanding of intellectual property rights, nurses may be exploited, as discussed by DJ:

We’re just starting a lot of these discussions, a lot of legal papers going back and forth, and agreements. It’s very complicated because you have to protect your invention. There’s only so much you can say about it until you file a non-disclosure, and there’s all this legal jargon. And that’s a big concern I have for nurses. That they don’t go out and get taken advantage of because they need to understand the intellectual property piece of it and other legal issues.

The exploitation some nurse innovators faced was mentioned as a serious threat to innovation practice. Having a solid understanding of intellectual property rights was discussed by nurse innovators as a significant part of the innovation process. Unfortunately, some nurse innovators described learning about the importance of intellectual property rights after it was too late. HN described a lesson learned:
We had our annual sales meeting at the end of the year with the sales guys. It’s a small company there is only like 25 of us. And the president congratulates everybody we made quotas we made a ton of money. But he said I got more good news, he said we just got a patent issued. And I thought patent that never crossed my mind. I went over to him, and I said, “That’s great. A patent is my name on it?” And he looked at me like a deer in headlights. He said, no, your name is not on the patent. Well, I never made that mistake again.

The nurse innovators shared their knowledge regarding the structuring of patent laws.

Several nurse innovators shared how laws surrounding patents and intellectual property favor the rights of certain disciplines. In general, an innovation developed by an independent contractor is owned by that contractor, even if the contractor was retained specifically to do the development work of the innovation. KD stated how this situation occurs when collaborating with other disciplines, such as engineering on an innovation: “And there’s some interesting barriers there both legally where there’s intellectual property issues if the nurse has an idea and if it’s made by an engineer, the way that patent law and other legal stuff is structured, it usually favors the engineer.” Some nurse innovators shared how they were able to retain the intellectual property rights for their innovation because of their savvy financial investments. Creating an independent website is how FY described the process for maintaining their rights to the intellectual property for their innovation:

I have a self-funded website, and I did that for a reason. I did not want any institution to take the concept and then brand it and call it their own. And that circumvented the major healthcare institution from doing it. They were certainly going to do that, but because I had a website and publications, that was almost a copyright. And so they couldn’t just say it was theirs.

The ownership of innovations was discussed by the nurse innovators in various workplace settings. Some institutions like the Veterans Affairs Hospital System provide a structure to support nurses’ retention of intellectual property and ownership. As JV shared, the VHA provides support for the entire innovation process:
I have retained ownership of my innovation throughout this entire process. There are other ideas, of course, where maybe it doesn’t make sense for the nurse to retain ownership of it, but they still retain credit for it throughout that entire process. Other things do require patents and stuff like that, and yes, of course, they retain ownership of that they are also listed on it. So, a big part of what the innovators network does is supports budding innovators, in every step of the way, like the spark seed spread application cycle, for instance. A spark would just be an idea, and maybe they’ll get funding for their idea in order to actually develop a prototype. And then maybe the next year because they develop the prototype now they get seed funding so that they can actually do a pilot, and they’ll get money to do a pilot. Next thing, maybe they have successful pilot, and now they’re ready to spread it either throughout their facility or to other facilities, and they’ll get even more money for that. But yes, within the VHA, that is one example. We have multiple entities to kind of help foster that culture of innovation and find the funding when we need it.

Taking precautions to ensure you are not prematurely talking about your innovative idea was discussed. The nurse innovators shared the need to be aware of the over-emphasized importance of patents and how to successfully illicit feedback for an idea without divulging the innovative solution. This was conceptualized by HN:

Don’t make the mistake of talking about your idea before you have it really hashed out, you know whether or not it’s patentable. Students with ideas get very hung up on patents sometimes too much. Don’t get crazy about patents. Just because something isn’t patentable doesn’t mean it won’t have value. That’s a mistake students make is they get hung up on, I got to have a patent. If it is patentable, then you definitely don’t want to be talking about it until you go through that process. You can share the concept you don’t share the idea. Because you have to get customer feedback. We call it not disclosing the secret sauce. You can talk about the need but don’t give them the solution.

Nurse innovators commented on the value of nursing knowledge. They felt that nurses should be aware that giving feedback on products in public is essentially handing over non-compensated intellectual property. ML shared a warning:

I also wish that nurses didn’t give away their innovation for free at conferences and trade booths. Because the industries are smart, they put the right people in those booths, to listen to the nurse go well if you just move this over here, and fix this over here, you’d have a much better product, and the next year that product comes out with those changes.
Navigating the technology transfer piece of intellectual property considerations was a barrier discussed by the nurse innovators. They noted that nurses should have an awareness of their work settings intellectual property policy, along with an extensive understanding of how they will be compensated or not compensated for an innovation. This essential knowledge was presented by IO:

But working with private organizations like think of just one of the competitors in your space that are for-profit that are non-academic. Many times, they want IP, no matter what you do, if you as a nurse invent something and you’re working there, they can very well and are coming back and saying, we’ll since you developed that while you were an employee, this is going to be ours. And even extended to the point of if we give you feedback on this innovation you’re considering using, then we want a piece of that IP or the IP, or you need to buy royalty fees from us associated with that. That has been a major limitation in what we do because I already described the challenges of academia and government that now those constraints are being put on by the for-profit arms of entities that and this is my opinion, not my employers but, I mean, that’s part of the problem with innovation is getting the technology transfer out of these private places or even the academic arms. Not all of them have the internal constructs to support actually getting innovation outside of their institutions.

Lack of a Definition of the Work of Nurse Innovators

Nurse innovators described innovation in many different ways. Innovation was explained as something new with the potential to reduce costs. Innovation was also described as improvements in quality care, practice environments, and outcomes. The importance of collaborative interprofessional innovation and broadening innovation to include more than just technology was discussed and examined. Finally, the nurse innovators emphatically stated their opposition to using the term nursing innovation when describing the work of nurse innovators. Some nurse innovators defined innovation as something that is new. Novel approaches were often described as products, models, processes, and solutions. They also described the importance of an innovation being useful:
• I think of it as new models, processes, products, and solutions that are inherent to what we do as nurses. But then it also benefits patients, communities, and also nurses in the way that we work. (LQ)

• Novel associations that are useful. (XA)

Innovation was portrayed as something new with economic value or cost-saving capabilities. The value of nurse innovators was described and found to exist in a monetary translation of significance as stated by nurse innovators:

• Any product or process that’s new to the people experiencing it that adds social and economic value to that group. (CM)

• Innovation in nursing is introducing something new that can be an idea, that can be a care delivery process, that might improve patient outcomes for a family community, improved efficiencies, or reduce costs. It might be an actual product, like a thing you can hold or touch. Or it might be like an algorithm. I think there’s a lot of different things innovation can be, but it’s essentially introducing something new. (VO)

Innovation was depicted as something new that creates an added benefit to the practice environment and serve as an added function for patients, nurses, and organizations:

Nursing innovation is the process of introducing something or someway new to the nursing practice environment that benefits nurses, patients’ organizations, or all of the above. And the thing or the way that is delivering benefit extends across the discovery of the thing or way, the evaluation of the thing or way, the implementation, education of use, and activities that reinforce and fortify acceptance of the innovation. (IO)

Innovation was portrayed as improvements in quality of patient care. Improving the quality of life for nurses was mentioned by several nurse innovators as an important component of the process of innovation:

• Innovation revolves around the nurses creating change in products or processes which improves the quality of care for our patients and or enhance the quality of life for our fellow nurses. (UB)

• Innovation is two-prong. It improves patient care, and on the nursing side, it improves the nurse’s ability to deliver that care. (ML)
Several nurse innovators connected the practice of innovation to improved outcomes. These outcomes included the work of nurses, the patient care experience, and healthcare overall. The nurse innovators focused on the experience of the patient as a main driver for innovative work, as illustrated by MT:

I think it’s those ideas and those products, or those processes that improves the patient’s experience, patient outcomes, or just improves the experience of providing that care to those patients—or just being a nurse. So, anything that improves that experience.

The interprofessional component of innovation as a collaborative endeavor was mentioned. The nurse innovators delineated that innovation should be more than just technology and should include a multitude of outcomes: products, systems, and programs. Some examples were highlighted by the nurse innovators:

- It is very collective, collaborative work rooted in evidence-based practice. It does not have to be a product or gadget. It can be a program, a process, or a system that helps to advance healthcare. It crosses over bridges that in the past we might have been afraid to cross, and it merges these silos that are independently in their own world. (FL)

- Typically, we think about innovation as technology, developing software-hardware, some kind of device. Something that has not been done before, and we need it for our patients. Not every kind of innovation has to result in some kind of patentable thing. (VI)

Innovation was described as creating new paradigms, incorporating risk, and examining outdated practices. Innovation was expressed as an endeavor that involves excitement and is driven out of a passion for improvement. Innovation requires creating a new worldview, according to OP:

It’s creativity, it’s visionary, and it’s evolved to a higher dimension of a new worldview. It’s a unitary worldview that invites new possibilities rather than trying to fix up current paradigms. Innovation requires breaking rules, non-conforming, and critiquing the status quo so that there is open space. It also requires reflection and listening to the inner voice about what might be rather than what is. It required boldness and risk but also passion and excitement.
The nurse innovators shared frustration about how the term innovation is used in health care. They felt that providing basic health care should not be innovative but rather a universal right for all individuals. Competing priorities and external expectations left some nurse innovators feeling pulled in non-essential directions. The consequences of ignoring the need for innovation was expressed by TF:

> It is solving all the problems in this space. I believe that you can’t look away. It may not be convenient. It may not be politically expedient. It may not be what people expect or want you to work on. But these are problems that have solutions if you care to solve them. Unfortunately, that’s seen as innovative, but here we are.

Several nurse innovators rejected the terminology nursing innovation and preferred to use the term innovation independent of nursing. Nurse innovators shared the belief that using the term nursing innovation was limiting to the work, scope, and understanding of nurses who innovate. This sentiment was echoed throughout several interviews:

- I don’t define nursing innovation. I define innovation. And I really don’t want to add that description to what we do. Because innovation is innovation. It doesn’t matter whether you’re a nurse, an engineer, a business person. It doesn’t matter. If you’re doing innovation, you’re doing innovation. I resist putting that label on innovation because what happens is that we, as women or we as women and nurses, tend to soften that definition to suit ourselves. And unfortunately, when we do that, we often don’t succeed in the real world where people are innovating. We have to define innovation the way the world defines innovation. (HN)

- I think innovation is a really overused word. It just literally means something new, a new method, idea, device. I also don’t think that nursing innovation is different than other innovations. So, I guess I am arguing with the term nursing innovation. So just to summarize, innovation means something new or looked at from a different angle. Putting two ideas together that hadn’t been put together before. And perhaps the nursing part would more relate to improving humans experience of life, rather than something that nurses do. (LC)

- I don’t define nursing innovation. I define innovation in general as the capacity to come up with creative solutions to complex situations. (FY)

- I don’t believe there is such a thing as nursing innovation. I believe there is healthcare innovation, and oftentimes that is engaged by nurses and has been engaged by nurses...
since the history of our profession. But I think defining it as nursing innovation delineates it from our peers and devalues the work that nurses are contributing. If we do it on an island, if we put ourselves on an island or a pedestal, then no one will see us. And we need to be seen and be viewed as co-founders and founders and not contributors without names. So in lieu of nursing innovation, I define healthcare innovation as the process of implementing new products, services, or solutions that creates new value. (JM)

Existing barriers described by nurse innovators provided an opportunity for the re-examination of how innovation is incorporated into nursing education, leadership support, nurses’ time, the understanding of intellectual property rights, and how the contributions of nurse innovators are described and defined. Nurse innovators have provided a roadmap for potential pitfalls that continue to impede innovative endeavors. The various practice environments in which nurses deliver care should be assessed and scrutinized for barriers to provide and sustain future opportunities for innovation to occur.

Summary

This study provided a myriad of examples of nurse innovators who impacted and added value to patients and the United States healthcare system by improving access to care by improving health equity. Nurse innovators demonstrated impact by recognizing gaps in healthcare and offered innovative solutions to address their patient’s complex health care needs. Nurses leveraged innovative capabilities to improve access and delivery of care services which directly improved patient outcomes. Many nurse innovators evaluated innovation success by conducting scientific research and incorporating various scales of measurement. Nurse innovators were successful in creating innovation impact by measuring the associated cost savings of their innovations. Internal and external dissemination was discussed by several nurse innovators who maximized innovation awareness by scaling out innovative initiatives. Nurse
innovators were able to broadly disseminate innovative initiatives to increase recognition of innovative practices and innovation expertise within and outside of the nursing profession.
CHAPTER 5
DISCUSSION

The intent of this study was to examine the value and impact of nurse innovators working in academic, industry, and government settings. This chapter includes a discussion of the major findings and the meanings, importance, and relevance of those findings in connection to the current literature. This chapter highlights the implications for nursing, examines the limitations of the study, and provides recommendations for future research. The discussion is based on the following research questions that guided this study:

1. How do nurses perceive that nursing innovation adds value to and/or impacts patients or The United States healthcare system?

2. What metrics/outcome measures do nurse innovators identify as relevant or useful to evaluate innovation success?

3. What methods/resources do nurse innovators report leveraging to disseminate innovation practice, initiatives, and outcomes?

A purposive sample of 31 nurse innovators participated in this study. Nurse innovators living in the United States who participated in this study demonstrated a recognized history of innovation thought leadership, innovativeness, published research on innovation, courses taught on innovation, or new products/processes or patents created. Semi-structured virtual interviews were conducted over five months. Participant data were organized using the NVivo software
platform. Data analysis for this study was based on Ritchie and Spencer’s (1994) framework, which provided a systematic structure to analyze and identify themes.

Interpretation of the Results

The four themes that emerged from data analysis include Theme 1- nurse innovators positively impacting their work setting environments; Theme 2- methods used to measure innovative practice; Theme 3- facilitating factors of innovation used by nurse innovators; and Theme 4- barriers faced by nurse innovators. Each theme was developed from the consolidation of the codes from data gained through semi-structured interviews. The themes are discussed both individually and at their points of intersection.

Nurse Innovators Positively Impacting their Work Setting Environments

This study revealed that nurse innovators positively impacted their work setting environments through a wide variety of intentional, innovative practices. The ability to create health equity for patients emerged as a critical innovation strategy for nurse innovators. This study highlighted several examples of nurse innovators who improved health equity by innovating products to deliver care to rural patients with limited access to medical care, improving the availability of technology resources for people with disabilities, and advocating for inmates and children in federal custody. One of the research questions of this study was how do nurses perceive that innovation impacts patients or the United States healthcare system? The findings from this study demonstrate how nurses are impacting patient outcomes by improving health equity at the individual and structural levels. As stated in *The Future of Nursing 2020-2030: Report*, "nurses have a critical role to play in achieving the goal of health equity"
These findings support the critical role that nurses assume as health equity advocates and innovators.

Nurse innovators were able to positively impact their workplace environment by creating novel spaces for inclusion and wellness. Dr. Marion Lynch (2022) innovated the I’m Fine Project which focused on helping nurses reflect and reframe their experiences during the COVID-19 pandemic through personal images and online learning. This project was initiated with the intent to provide a mechanism to support nurses’ healing and recovery (Lynch, 2022). Similar instances of innovative endeavors to promote a healing environment were noted in this study, including the innovation of system-wide communities of support, wellness models, and processes to increase mental health practices.

The findings of this study indicated that nurse innovators positively impacted their environment by recognizing gaps in healthcare. Innovative solutions were developed and deployed by nurse innovators to address gaps in care by expanding access to care, providing resources for vulnerable populations, creating communities of support, and designing innovation education. Nurse innovators reflected on their workplace settings and described recognized gaps such as workflow issues, the inability to integrate innovation at the bedside, and health care products that often impeded patient care. Not only were nurses able to recognize gaps at the unit, hospital, and system level, this study found that nurses were able to recognize gaps on a national level. Nurse innovators positively impacted hundreds of workplace environments by creating innovative solutions to address complex issues such as the nationwide nursing staffing shortage. Nurses leveraged innovative capabilities to improve staffing shortages which in turn directly improved patient outcomes.
Ronquillo et al. (2022) recently noted a gap in nursing’s involvement with innovations related to artificial intelligence (AI). Nurse innovators established the Nursing and Artificial Intelligence Leadership (NAIL) Collaborative to engage nurses from the development to implementation stages of AI (Ronquillo et al., 2021). The NAIL Collaborative is currently engaged in efforts to leverage the untapped potential of nurses and their ability to contribute to the development of AI technologies to improve humanitarian efforts and global health initiatives. Findings from this study support the capacity of nurse innovators to boundary span into new spaces to fill existing gaps related to nursing representation.

This study found that nurses demonstrated an ability to positively impact their environment by solving healthcare problems using human-centered design. Research has shown that human-centered design is considered a new and important method for organizations to utilize to advance innovation (Melles et al., 2021; Zuber & Moody, 2018). Nurse innovators used human-centered design to improve patient outcomes by increasing the safety of home environments, reducing rehospitalization rates, and holistically addressing patients' individualized needs. In addition, this study provided evidence that nurse innovators used human-centered design as a mechanism to improve patient outcomes through the implementation of policies and federal legislation. Several products were innovated by nurses using human-centered design approaches to enhance communication between patients and healthcare providers. This is a significant finding as miscommunication is the leading cause of sentinel events and a significant financial burden on the United States healthcare system (Humphrey et al., 2022).

Nurse innovators should continue to leverage human design principles in order to drive effective change and address complex issues such as patient safety. The value of incorporating
Human-Centered design was described by Erwin & Krishnan (2016) as “the key is to shift our focus from helping people to fit our care delivery system, to one where we design our care delivery system to fit people where they live, work, learn, play and receive healthcare (2016, p.2).” An example from this study of nurse innovators re-designing aspects of the care delivery system included nurse innovators creating and implementing standardizing protocols on a system-wide level to improve the safety of health care colleagues, which significantly impacted the overall culture of their workplace environment.

**Methods Used by Nurse Innovators to Measure Innovative Practice**

Many nurse innovators used scientific research and various methodologies to measure the use, efficiency, scalability, impact, and satisfaction of their innovations. Brunson (2021) states, "Innovation is the thoughtful integration of science to have a positive impact on outcomes" (Brunson, 2021, p. 25). One of the guiding questions of this research study was what metrics/outcomes measures do nurse innovators identify as relevant or useful to evaluate innovation success? A key finding in this study was that outcome measures associated with innovative initiatives provided evidence to demonstrate the value and impact of innovation practice. Usability trails, AB testing, focus groups, proof of concept, and randomized controlled trials were methods used by nurse innovators to demonstrate innovation value and impact. This study provides support for the importance of measuring innovation outcomes to demonstrate the value and impact of innovative endeavors initiated by nurses. Nurse innovators who conducted research and used scales of measurement to measure their innovative endeavors stated improved success with garnering innovation support from healthcare leadership. This finding will be useful
for nurses to incorporate as health care leaders are usually involved as key stakeholders during the innovation process.

A significant finding in this study includes the ability of nurse innovators to create innovation impact by demonstrating significant cost savings for their innovations. A point of convergence occurred for nurse innovators between demonstrating financial impact and using language to appropriately reflect outcomes. Nurse innovators revealed the importance of speaking the same financial language as the stakeholders involved in the innovation process. As healthcare systems look to improve efficiencies and reduce costs, it is essential for nurse innovators to demonstrate a financial benefit. A recent study conducted by Zanini et al. (2021) demonstrated how an innovative nutritional intervention for dysphagic older adults impacted the nursing workload and associated costs for nursing homes. Focusing on an innovation to improve nutritional status resulted in more efficient use of nurses’ expertise and cost savings due to reduced time spent on spoon-feeding and surveillance of patients (Zanini et al., 2021). This study found that nurse innovators who were able to demonstrate an ability to save money or generate revenue stated an increased ability to gain momentum for their innovation. This finding is important for nurses who could benefit from incorporating financial measures during the early stages of the innovation process.

Nurse innovators successfully demonstrated the ability to scale out innovations through engagement, replication, and dissemination. Scaling out innovations incorporates building external awareness of innovation capabilities. A study by Leary and colleagues, (2021) explored creating an innovation infrastructure in academic nursing. Findings from the study revealed that building bridges across schools and disciplines provided an avenue to gain knowledge, create partnerships, and build external awareness for innovative initiatives. A guiding question for this
research study was what methods do nurse innovators report leveraging to disseminate innovative practice, initiatives, and outcomes? This study found that nurse innovators intentionally looked for opportunities to disseminate their innovative endeavors not only within nursing but outside the profession of nursing. Nurse innovators published in business, engineering, and computer science journals and attended conferences not normally associated with nursing as a method to expand innovation awareness. This study found that nurse innovators created networks with business and engineering experts to further advance their innovative ideas. Innovators working outside of the nursing profession could further their innovations through the inclusion of nurses’ expertise, highlighting the importance of internal and external collaborations (Koszalinski et al., 2021).

This study found that nurse innovators were able to incorporate the process of scaling deep during their innovation process. Scaling deep includes nurse innovators gathering and incorporating feedback to maximize innovation outcomes. Nurse innovators collected and implemented feedback to improve innovations. New possibilities emerge when nurses are able to gather feedback from inside and outside of their existing networks (Sensmeier, 2021). A point of intersection not found in the literature occurred in this research study for nurse innovators between the process of scaling deep and incorporating the human-centered design. This study found that as nurse innovators engaged in the process of incorporating feedback from end-users, the innovations reflected more of the unique needs of the end-users.

**Facilitating Factors of Innovation Used by Nurse Innovators**

This study found that nurse innovators embraced innovative language to facilitate the dissemination of innovative practices. Nurse innovators leveraged the power of their voice to
accurately reflect the value and impact of their innovative work. The intentionality of using certain words such as "innovation" rather than "workaround" was used by nurse innovators as a mechanism to promote their innovative initiatives. Health care workers are typically involved in several workarounds per shift, which delay process improvements and lead to inconsistent practices that may jeopardize patient care outcomes (Debono et al., 2013). A study by McEachern (2019) examined leadership influence in the adoption of innovation by critical care nurses and found that nursing leaders demonstrated a lack of innovation language, which was described as a barrier to innovation practice. Nurses who support innovation practice by accurately describing innovation practices provide recognition for their work as innovators and allow for measurable outcomes to be captured.

As described by Sensmeier (2021), it is helpful for nurses to have a mentor that can provide support during moments of failure, which is an expected part of the innovation process. Nurse innovators described the importance of having innovative role models and mentors to support their innovative practices. This study found that nurse innovators who had innovative role models felt an increase in support and greater networking ability to further their innovative endeavors. Nurse leaders who role model risk-taking, foster creative problem solving, and create spaces for collaboration will promote a more innovative culture (Snow, 2019). This study supports the necessity of nurse innovators embracing mentorship and role modeling as a method of sustainability for innovation practice within the profession of nursing.

It is important to note that nurse innovators in this study were able to improve innovative outcomes when collaborating with an interprofessional team. Garvey et al. (2022) found that Tag Team Simulation (TTS) can be used as an innovative method to improve the cultural capabilities of interprofessional students. A simulation to build cultural competence was co-designed and
delivered by Aboriginal people and an interdisciplinary team of health professionals (Garvey et al., 2022). Diverse interprofessional team members offer an opportunity to provide accurate and meaningful simulation scenarios that encourage cultural competence.

A significant finding in this study was that nurse innovators who were able to successfully integrate knowledge from multiple disciplines created more opportunities for innovation to occur. Too often, health care professionals work in siloed disciplines, impeding their ability to innovate. Nurse innovators discussed nursing as a unique science and were aware of the hesitancy for nurses to emerge from siloed practices. This study found that leveraging the expertise of interprofessional team members created a more holistic approach for the implementation of innovative solutions. This supports the findings of a recent study that found interprofessional health care professionals who engaged in innovative practice had a positive effect on interprofessional learning and intent to stay (Raderstorf et al., 2020). This finding is important for nurses to consider during the early stages of innovation during the selection process of team members.

**Barriers Faced by Nurse Innovators**

The current study revealed that regardless of workplace settings, nurse innovators encountered several barriers to innovation. The lack of innovation education in nursing curriculum was found to be a significant barrier to nurses perceiving themselves as innovators. The reimagination of the future of nursing, as stated by the American Nurses Association, includes arming nursing graduates with practice-ready skills, including innovative competency testing to ensure that they can contribute and thrive in a rapidly evolving healthcare system (ANA, 2021). However, to effectively demonstrate practice-ready innovation skills, nurses must
receive consistent innovation knowledge to take on the role of innovator (Cusson et al., 2019). This study found that nurse innovators felt extremely challenged by the lack of understanding regarding the innovation process and the innovation methodology needed to bring an idea into reality.

Nurses who are interested in innovation could benefit from seeking out educational and health care institutions that support innovation education. As noted in the literature, several schools of nursing are currently infusing innovation into nursing curriculum and creating physical spaces, including innovation labs for nursing students to routinely engage in innovation practice (Leary et al., 2021). Nursing schools that incorporate innovation education will be more competitive as an increasing number of nurses look to foster their innovative capabilities. As the ANA creates a re-imagined vision for the future of nursing, including innovation competency testing, nurses who receive innovation education will be equipped to thrive in a rapidly changing environment.

The lack of time to innovate was found to have a detrimental effect on the innovation practices of nurses. Cianelli and colleagues, however, remind us that organizations should consider providing time to innovate through existing structures such as committee and shared governance meetings, with no additional costs incurred (Cianelli et al., 2016). Organizations that provide and incentivize innovation practice may benefit by increased employee retention. Re-imagining the definition of “productive time” or time that is not spent providing direct patient care may create an opportunity for interprofessionals to brainstorm together to foster innovation practices (Altman & Rosa, 2015; Sensmeier, 2021). As health care organizations grapple with staffing shortages, mechanisms such as innovation engagement that promote employee retention should be examined.
This study found that a lack of leadership support for innovation was identified as an existing barrier to innovative practice. This finding supports previous research findings related to innovation and nursing leadership. A survey conducted by The University of Pennsylvania School of Nursing and the BDO Center for Health Care Excellence revealed that less than half of business leaders surveyed had nursing represented within their Executive Suites (BDO, 2019). Zuber and Moody (2018) revealed that nursing leaders may be unaware of the necessary conditions needed to support innovation within the workplace setting. Although leaders are pivotal to shaping the organizational environment, Weberg and Davidson (2020) report they rarely receive training on how to be innovative.

The COVID-19 pandemic created a need for the rapid deployment of innovative ideas to provide patient care in an ever-changing environment. It is important to note that nurse leaders quickly realized that the implementation of innovation at the bedside was imperative during the pandemic to improve outcomes and patient safety (Brunson, 2021). A study conducted by Stilgenbauer (2019) found that nurse managers displayed the least amount of innovativeness among all nurse administrators. This finding is significant in that nurse managers are the most proximal leaders to front-line nursing staff. A study by McEachern (2019) examining leadership influence and the adoption of innovation by critical care nurses found that nurse leaders must observe organizational culture, innovation resources and drivers, the willingness of employees to adopt innovation practices, and interdisciplinary team collaboration for innovation to occur. This study interestingly found that leaders who supported nurses and embraced an innovation mindset were successful in implementing innovative solutions in their workplace settings. Findings from this study support a need for nursing leadership to embrace innovation practice as a nursing skill that should be supported and encouraged.
The lack of knowledge regarding intellectual property rights was determined an existing barrier for many nurse innovators. An examination of nurse-authored patents by Davis and Glasgow (2020) revealed that in the United States, the term “nurse” is recurrently absent from awarded patents indicating that important discoveries or innovations are likely being overlooked. Nurses need to retain their intellectual property through mechanisms such as copyrights, patents, and trademarks in order to ensure ownership. This study's findings reveal that nurses are not reimbursed for their innovative ideas or expertise and that all too often, nurses give their ideas away for free. According to the nurses in this study, nurse innovators should leverage their innovation knowledge and be paid as consultants when providing feedback or informing on innovative products used in the healthcare environment.

Finally, this study found that the lack of a definition to illustrate the work of nurse innovators was a barrier to innovation practice, in that 31 nurse innovators described innovation in 31 different ways. An unexpected finding that was not seen in the literature was that several nurse innovators rejected the term "nursing innovation" because they believed it inaccurately reflected their innovative contributions. A recurring statement shared by several nurse innovators was that the term nursing innovation devalues the work of nurse innovators. Nurse innovators felt they should be described in the same way that other professions are described, such as engineers and physicians who are engaged in innovation. Being mindful of the difference between the terms "nursing innovation" and "nurse innovators" is an important delineation for the profession of nursing, according to the subjects in the study. Nurses who are interested in demonstrating innovation expertise should consistently embrace language that supports the value and impact of their innovative endeavors.
Limitations

There are several limitations of this study. Nurse innovators with a recognized history of innovation were included to participate in this study. Nurse innovators not yet recognized as innovators may have provided beneficial insight into the innovation process. The inclusion criteria of this study limited the perspective of nurse innovators to Registered Nurses (RNs). Licensed practical nurses (LPNs) have contributed to innovative practices and initiatives and could inform on innovative practices within the profession of nursing.

Virtual interviews were conducted during this research study which led to the feasibility of participation but may have prevented the researcher from visualizing nurse innovators in their natural field settings. Another limitation identified was the use of snowball sampling. Because the process of snowball sampling is based on referrals from study participants rather than random selection, the representativeness of the group may be affected. This research study was conducted during a global pandemic, thus, potentially limiting participation. This presented limitations for scheduling interviews as study participants were operating on a day-by-day basis and often had to re-schedule their interviews because of their fluctuating calendars.

Finally, all of the nurse innovators who participated in this study were from the United States. This was a limitation as the findings from this study were all from the perspective of nurses working in the same country. Nurse innovators working in countries outside of The United States have stated innovation is used as a mechanism for survival rather than a tool for advancement. The work of international nurse innovators would add depth to this study.
Implications for Nursing

The critical implication of this study is that nurse innovators who leverage innovation methodologies and use measures to capture innovation impact are able to empirically demonstrate their value to the United States healthcare system. As noted in the literature, nurses are not being utilized to their fullest potential regarding product and service innovation (Roddy & Polfuss, 2020); therefore, nurse innovators would benefit from the employment of metrics early on in their innovation process to successfully capture and demonstrate innovation outcomes and expertise. Innovation research is aiding in the identification of how nurses can leverage their skills and knowledge to improve health care delivery and outcomes (Thomas et al., 2016). Nurses who employ research methodologies to highlight the outcomes of successful innovation initiatives can garner increased support for future innovative endeavors.

Education settings that support innovation in nursing curricula are leading the charge in the advancement of the nursing profession. The partnering of biomedical engineering and nursing disciplines is one example of how nurses may engage in patient-care innovations with the creation of new roles such as nurse engineering (Davis & Glasgow, 2020). For the next generation of nurses to lead innovative practice initiatives, nursing schools must provide knowledge and skills to support innovation practice and research (Leary et al., 2021). Nurses should intentionally seek out nursing programs that have successfully incorporated innovation methodologies into nursing curriculum and have strategically prioritized innovation as an essential competency for nurses.

Nurse innovators who are able to foster innovation practice in others through role modeling and mentorship will begin to create an innovation ecosystem, an interconnection of
people, places, and resources to advance innovation practice. As nurses continue to portray innovation capabilities during daily nursing practice, future nurse innovators will be inspired. As innovation is identified as a method to engage nurses in improved healthcare outcomes, nurse leaders must support opportunities for innovation to occur. A study by Asli (2016) examined team-level factors that affected innovation in a multidisciplinary capstone design course. Results found that support for innovation from supervisors had a strong positive correlation with innovation and that support for innovation from supervisors had a positive correlation with support for innovation from team members. Findings from this study confirm the need for leadership support for the realization and implementation of innovation practices.

A recent study by Emiralioglu and Sonmez (2021) found a significant correlation between nursing work environment and innovation support with innovation behaviors and outputs. It is imperative that nursing leaders are cognizant of their own preexisting beliefs and biases that may unintentionally affect the output of organizational creativity (Butler & Roberto, 2018). Nurse leaders should ensure that nurses are involved in system-level efforts to infuse innovative practice into bedside nursing practice, thus creating an innovation ecosystem.

Nurse innovators who disseminate the progression of their innovative endeavors will provide strategies for other nurses to emulate and incorporate into their nursing practice. These strategies will provide a roadmap to encourage uptake of innovation initiatives in work settings where innovation is not the norm. As evidenced by a recent study by Abbot and Bryar (2022), innovative initiatives conceptualized by nurses should be evaluated so findings can be disseminated. Nursing leaders, educators, and researchers should broadly disseminate innovative initiatives to increase awareness of innovative practices within nursing. Disseminating findings
that support the value of innovation practice may inspire others to consider innovation opportunities when they arise.

A key finding in this study involved nurse innovators using quantitative language to garner leadership support and funding for innovative practices. Health care leaders speak and understand the language of numbers. “Becoming comfortable in a business environment and learning the language will help you feel more like a member of the innovation team rather than an outsider looking in “(Sensmeier, 2021, p.18). Nurse innovators gained traction with their innovations when they used language that included words such as return on investment, percentage of impact, and other metrics to demonstrate the effectiveness of their innovation. This language needs to be reinforced with nurse innovators.

International networks created by nurse innovators will be key to advancing global initiatives and expanding innovation practice. Continuing to build external networks to support innovator-investor partnerships will be critical for securing increased resources and alternative funding models. External partnerships have improved patient access to health care through the introduction of telemedicine, improved patient satisfaction, and created new opportunities for innovation growth. Lumify Care, a company co-founded by two nurses, Jennifferre Mancillas and Anthony Scarpone-Lambert, is the first fully nurse-led company in Y Combinator. The Y Combinator is a start-up accelerator that has launched start-ups including Airbnb, DoorDash, and Instacart (Y Combinator, 2000). Through partnerships with venture capitalists, incubators, and accelerators, nurse innovators may obtain the funding and resources to transform health care.
Implications for Theory

The triple helix model demonstrates how innovation is supported through collaboration among academic, industry, and government entities. Nurse innovators in this study have demonstrated interprofessional collaborations and partnerships in academic, industry, and government settings. Cross-industry partnerships will continue to provide support, resources, and recognition for the work of nurse innovators and create a working model for future interprofessional collaborations. Interprofessional innovation teams may promote innovation to occur by creating greater potential for dissemination, expanded networks, and scalability by involving multiple entities in the innovation process.

The conceptual framework for innovation in healthcare created by Omachonu and Einspruch (2010) advocates that the patient remains at the center of all health care practices. Nurse innovators were able to solve existing health care problems in a variety of settings using Human Centered Design practices. A study by Bimpeh (2019) examined innovation strategies in health care organizations found that service innovation strategies were linked to increased performance in health care organizations, including service accessibility and patient engagement. Patients who are engaged in their health care offer unique insight into the needs of the people experiencing a problem. As evident in the conceptual framework for innovation, improving outcomes begins with understanding how the patient is seen, heard, and how their needs are met. Human Centered Design practices incorporated by nurse innovators were described as a means to amplify the voice of the patient to meet their unique health care needs.
Recommendations for Future Research

Further research is needed to examine the work of international nurse innovators. Exploration of the value and impact of nurse innovators working in countries outside of the United States may provide an opportunity to improve health care outcomes for global citizens. Nurse innovators working in countries with limited resources could provide a unique perspective on how to maximize the resources at hand. A more in-depth qualitative inquiry could be accomplished through focus groups to fully understand the barriers and facilitators that nurse innovators working in other countries encounter.

An alternative approach to this study could include examining interprofessional innovation teams. By exploring the innovation practices of interprofessional teams, a researcher could gain a deeper understanding of factors that affect innovative practices in a larger healthcare system. This insight may be useful to understand how innovative initiatives are deployed, maintained, and sustained within a multitude of settings. Conducting focus groups with interprofessional teams would elicit factors related to teamwork from a variety of disciplines and provide a deeper understanding of how innovative teams support and implement innovative initiatives.

More research is needed on the innovation practice of novice nurse innovators during the early stages of their innovation journey. The early stages of innovation may be the phase where most nurses get deterred from the innovation process. Research surrounding novice nurse innovators can provide a more holistic picture of the longitudinal journey of innovators. Additionally, research surrounding why an innovation failed or did not make it to fruition is important to consider when attempting to understand the entirety of the innovation process.
Nurse innovators who were unable to proceed with an innovation would provide valuable insight into themes surrounding failure tolerance, risk mitigation, and additional barriers encountered during the innovative process.

Future research exploring schools of nursing infusing innovation education into nursing curriculum should be examined to ascertain the impact and outcomes related to innovation nursing education. Nursing students who have benefited from innovation education could provide strategies and methods to incorporate innovation knowledge into daily nursing practice. Further insight into the innovation practices of all levels of nursing education is needed to understand the innovation practices of both Licensed Practical Nurses and Registered Nurses.

Exploring the work of nurse innovators who use biomimicry as an innovation strategy should be studied. Biomimicry is a practice that learns from and mimics the strategies found in nature to solve complex problems. Biomimicry is widely used in fields such as engineering and architecture. Nurse innovators who are currently using biomimicry as a methodology to improve innovative ideas and design should be examined to further the adoption of biomimicry principles in nursing education and innovation practices.

Finally, a further examination of the explosion of innovation that occurred during the pandemic by nurses is needed. During one of the most challenging times in health care, nurses addressed issues such as personal protective equipment shortages through innovative solutions. Innovation strategies that were easily integrated into health care practices during the pandemic to improve workflows and patient outcomes should be further explored.
Conclusion

The United States healthcare system continues to face complex, multi-dimensional challenges that require innovative approaches and solutions. Nurse Innovators have added value to the United States healthcare system through innovative cost-saving mechanisms specifically aimed at addressing existing healthcare inequities. Improved patient outcomes have been validated by nurse innovators who have successfully leveraged research methods to measure the impact of their innovative endeavors. Nurse innovators have expanded dissemination strategies outside the profession of nursing, which has amplified the innovation expertise of nurse innovators and created innovation recognition within the profession of nursing.

The COVID pandemic has exacerbated existing issues in health care, including staffing and medical supply shortages, patient safety concerns, burnout rates, and compassion fatigue among health care professionals. Innovation offers readily accessible solutions to accurately address recurring issues in health care. Engaging in innovation practice can serve as a renewable fountain of motivation, synergy, and the possibility to create tangible and effective change. As more schools of nursing begin to infuse innovative methodologies into nursing curriculum, a greater number of nurses will gain the ability to practice nursing at their fullest potential. Nurses who conceptualize, implement, evaluate, and diffuse innovative practices will enhance the landscape of the health care ecosystem. As nurse innovators continue to own and embrace their innovator capabilities, health care as we know it has the potential to be transformed.


https://emdaily.cooperhealth.org/content/discovery-prone-positioning-ards


Hamstra, B. (2019). I’m a gay nurse and I was banned from giving blood. https://nurse.org/articles/nurse-blake-banned-from-giving-blood/


https://www.paintingsinhospitals.org.uk/Handlers/Download.ashx?IDMF=b7b73785-8efa-41b2-aff0-a87a371cfbdf


O’Sullivan, D. Dooley, L. Applying Innovation. Los Angeles, CA: SAGE


APPENDIX A

INFORMED CONSENT
This is a voluntary research study on using measurable outcomes to demonstrate the impact and value of nursing innovation

This study involves participating in a virtual interview lasting 30-60 minutes and reviewing your interview transcript for accuracy

The benefits of this study include informing the public on how nurses innovate and what outcome measures are used to prove the impact of nursing innovation, there are no risks in participating in this study other than providing your information.

Purpose and what you will be doing:

The purpose of this study is to provide an understanding of the value and impact of nurse innovators measurable outcomes in health care from academic, industry, and government settings. Approximately 30 nurse innovators will participate in this study. No one will be paid to be in the study, and enrollment will begin on January 15th, 2021, and end on May 30th, 2021.

To be in the study, you will be asked to participate in interviews with the principal investigator (PI) via Zoom virtual platform and will have the opportunity to review the interview protocol prior to the interview. The interviews will be audio recorded. The PI will ask questions, collect and analyze data, and report findings. You will be asked to respond to questions in one-on-one virtual interviews with the PI.

The process will be to identify nurse innovators in academic, industry, and government settings who have a recognized history of nursing innovation expertise. The PI will ask a standard set of open-ended questions and follow-up questions as needed. Your agreement to participate in this study includes authorization for the PI to take notes, audio record each interview, and transcribe the recording.

The interviews will take between 30 minutes to one hour of your time. You will be provided an opportunity to review the interview transcript to ensure the accuracy of the recorded transcript. All of the information that you supply will be held in the strictest of confidence. The audio recordings will be deleted after the transcription is reviewed and approved by you.

Risks:

There are no risks in participating in this study other than providing your information. Your confidentiality will be maintained by assigning you a pseudonym. All field notes, digital
recordings, and transcriptions will be labeled with the pseudonym. Your information will be kept private at all times, and all study documents will be destroyed five years after the conclusion of the study.

Benefits:

The existing literature provides little information regarding the impact and value of nurse innovators on the United States healthcare system. The information you provide during this interview will inform the public on how nurses innovate and what outcome measure or metrics are used to prove the impact of nursing innovation.

Right to Withdraw:

Your participation is greatly appreciated, however at any point, you may choose to withdraw from the study. You may skip any question that you do not wish to answer, and at any time, if you experience a negative emotion from answering the questions, inform the PI, and the interview will conclude.

Future Use of the Research Data

Your information collected as a part of this research will not be used or distributed for future research, even if all identifiers are removed.

Contact Information:

You will receive a copy of this consent form. If you have any questions, you can talk to or write the principal investigator. If you would like to speak with a participant advocate other than the principal investigator, you can contact Dr. Jeanette Rossetti rossetti@niu.edu.

Your Statement of Consent:

I have read the above information. I asked questions if I had them, and my questions were answered. I volunteer my consent for this study.

Participant Name: _______________________

Date: ___________________

Investigator Name: _______________________

Date: ___________________

Dissertation Chair: Dr. Jeanette Rossetti

Email: ________________

Principal Investigator: Olivia A. Lemberger

Email: ________________

Northern Illinois University 1425 W. Lincoln Hwy, DeKalb, IL 60115
APPENDIX B

INTERVIEW PROTOCOL
This conversation will be recorded. Everything that you say is held in confidence and is anonymous. If you mention any specific names, they will be coded using pseudonyms before the transcript is released for review. You will receive a copy via email of the edited transcript for review and redaction if needed. This interview is about understanding how nurses innovate, what outcome measure or metrics are used to prove the impact of your innovation, and how such outcomes are disseminated.

Interview Questions:

1) How do you define nursing innovation?

2) How have you contributed to the field of nursing innovation? Tell me about your nursing innovation journey?

3) How do you think your innovation changed the profession of nursing or the nursing innovation community?

4) Please give me an example of how your innovation adds value to patients and/or the United States health care system (other)?

5) How did you determine that your innovation was successful?

6) Are there particular areas of your nursing innovation you decided to measure? And how did you measure it?

7) Who do you see as your customers? Did you incorporate customer feedback-end-user feedback into how you measured outcomes? If yes, how so? If not, why not?

8) Have you compared outcomes with other nurse innovators? How?

9) How have you told others about your innovation? Who?

10) What health care innovations created by nurses do feel are important to share?

11) Do you have an example of collaboration with academic, industry, and/or government entities during your innovation process? Tell me about it why or why not?

12) If you had a magic wand, how would you improve nursing innovation?
APPENDIX C

DEFINITIONS OF INNOVATION
<table>
<thead>
<tr>
<th>Authors</th>
<th>Definitions of Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teresa Amabile (1996) Harvard Business School</td>
<td>“Innovation is the successful implementation of ideas within an organization.”</td>
</tr>
<tr>
<td>Lachnan et al., (2006)</td>
<td>“Innovation is the application of creativity or problem solving that results in a widely adopted strategy, product, or service that meets a new in a new and different way.” (p.1675)</td>
</tr>
<tr>
<td>The University of Iowa <em>Innovation SIG</em>. Definition of Innovation (unpublished document) Iowa City: The University of Iowa, 2017</td>
<td>“Innovation is a new mindset triggered by a different context to enable new, useful, creative and unexpected linkages that will generate a solution or adaptation to a practice, scientific, teaching, or research problem that adds value to the university or healthcare.”</td>
</tr>
<tr>
<td>McSherry &amp; Douglas (2011)</td>
<td>“A new method and/or practice device.”</td>
</tr>
<tr>
<td>Rogers (2003)</td>
<td>“An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption.”</td>
</tr>
<tr>
<td>Joseph Schumpeter</td>
<td>“Innovation can be viewed as new combinations of new or existing knowledge, resources, equipment, and other factors.”</td>
</tr>
<tr>
<td>Peter Drucker</td>
<td>“Innovation is the tool that can exploit change as an opportunity. It is capable of being presented as a discipline, capable of being learned and capable of being practiced.” (Drucker, 1985, p.20)</td>
</tr>
<tr>
<td>Clayton Christensen</td>
<td>“Innovation is doing something different that has an impact with the unspoken goal of solving a problem.”</td>
</tr>
<tr>
<td>Merriam-Webster</td>
<td>“Innovation is a new idea, device, or method.”</td>
</tr>
<tr>
<td>International Council of Nurses (ICN)</td>
<td>“Innovation is a process of developing new approaches, technologies, and ways of working.”</td>
</tr>
<tr>
<td>The National Health Service</td>
<td>“Innovation is about doing things differently or doing things to achieve large gains in performance.”</td>
</tr>
<tr>
<td>The American Nurses Association</td>
<td>“Nurses create new solutions and improve existing healthcare practices. Nurses are clinicians, innovators, designers, scientists,</td>
</tr>
<tr>
<td>Source</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>educators, entrepreneurs, and chang agents.</td>
<td>Innovation is a fundamental part of the nursing process.” (ANA, 2021, p. 57)</td>
</tr>
<tr>
<td>Afuah (1998)</td>
<td>“Innovation is new knowledge incorporated in products, processes or services.”</td>
</tr>
<tr>
<td>Van de Ven (1986)</td>
<td>“Innovation is the development and implementation of new ideas by people who over time engage in transactions with others within an institutional order.”</td>
</tr>
<tr>
<td>National Endowment for Science Technology and the Arts (NETSA, 2009)</td>
<td>Innovation is “change associated with the creation and adaptation of ideas that are new-to-world, new to nation/region, new-to-industry or new-to-firm.”</td>
</tr>
<tr>
<td>West &amp; Farr (1990, p. 9)</td>
<td>“The intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society.”</td>
</tr>
</tbody>
</table>
APPENDIX D

UNIVERSITY RANKING FOR INNOVATION IMPACT TOP 25 OF 195 RANKED INSTITUTIONS
1. University of California System
2. University of Texas System
3. Massachusetts Institute of Technology (MIT)
4. University of Washington
5. University of Michigan
6. University of Florida
7. Columbia University
8. University of Minnesota
9. Stanford University
10. University of Pennsylvania
11. Johns Hopkins University
12. University of Illinois at Urbana-Champaign
13. University System of Maryland
14. University of Wisconsin-Madison
15. Purdue University
16. Northwestern University
17. New York University
18. University of Pittsburgh
19. Cornell University
20. North Carolina State University
21. Harvard University
22. Ohio State University
23. Duke University
24. University of Utah
25. State University of New York

(Cullum Clark et al., 2020).
APPENDIX E

COMMONLY USED QUALITY PERFORMANCE MEASURES IN HEALTHCARE
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>1. Number of Patients Served Per Month</th>
<th>Tracks the number of individuals receiving care each month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Length of Stay</td>
<td>Tracks the providers ability to diagnose and treat</td>
</tr>
<tr>
<td></td>
<td>3. Readmission Rates</td>
<td>The number of patients entering the hospital for the same condition they were previously treated for</td>
</tr>
<tr>
<td></td>
<td>4. Equipment Utilization Rates</td>
<td>Number of days equipment was actually available</td>
</tr>
<tr>
<td></td>
<td>5. Staff Overtime</td>
<td>Number of hours staff members work beyond normal hours</td>
</tr>
<tr>
<td>FINANCE</td>
<td>6. Total Expenditures</td>
<td>Total amount of money the organization spends</td>
</tr>
<tr>
<td></td>
<td>7. Total Operating Margin</td>
<td>Measures hospitals profit after removing costs</td>
</tr>
<tr>
<td></td>
<td>8. Average Cost Per Discharge</td>
<td>Averages the cost incurred for a patient’s entire stay</td>
</tr>
<tr>
<td></td>
<td>9. Bad Debt</td>
<td>Calculates the difference between the amount billed to a patient and the amount paid by the patient</td>
</tr>
<tr>
<td>COMMUNICATIONS</td>
<td>10. Impatient/outpatient Satisfaction with Physician</td>
<td>Communicates the level of overall satisfaction among patients</td>
</tr>
<tr>
<td></td>
<td>11. Employee Turnover Rates</td>
<td>Shows the steadiness of the workforce</td>
</tr>
<tr>
<td></td>
<td>12. Employee Satisfaction</td>
<td>Gauges the satisfaction level of employees</td>
</tr>
<tr>
<td></td>
<td>13. Percentage of Electronic Health Records (EHR)</td>
<td>Demonstrates an organizations level of technological advancement</td>
</tr>
<tr>
<td>CARE</td>
<td>14. Patient Retention Rates</td>
<td>Tracks how many patients return to an organization for another unrelated visit</td>
</tr>
<tr>
<td></td>
<td>15. Quality of Nursing Care</td>
<td>Patient satisfaction of nursing care provided</td>
</tr>
<tr>
<td></td>
<td>16. Mortality Rates</td>
<td>Tracks the observed number of patent deaths versus expected number of deaths</td>
</tr>
<tr>
<td></td>
<td>17. Rate of Complications</td>
<td>Number of patients that have complications related to the care they received at the organization</td>
</tr>
</tbody>
</table>

(Dillon, n.d.)
APPENDIX F

25 HEALTHCARE METRICS AND KEY PERFORMANCE INDICATORS (KPIS)
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>1. Patient Wait Time</th>
<th>Calculates the patient wait time before seeing a provider</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Average Number of Patient Rooms in Use at One Time</td>
<td>Demonstrates how well space is used, occupancy rate</td>
</tr>
<tr>
<td></td>
<td>3. Staff-To-Patient Ratio</td>
<td>Indicates the use of capacity and staff resources</td>
</tr>
<tr>
<td></td>
<td>4. Bed or Room Turnover</td>
<td>Demonstrates how fast patient are moving in and out of the facility</td>
</tr>
<tr>
<td></td>
<td>5. Communication Between Primary Care Physician, Proceduralist and Patient</td>
<td>Determines how frequently providers are in communication with one another and their patients</td>
</tr>
<tr>
<td>FINANCE</td>
<td>6. Average Insurance Claim Processing Time and Cost</td>
<td>Averages the amount of time and money an organization spends processing insurance claims</td>
</tr>
<tr>
<td></td>
<td>7. Claims Denial Rate</td>
<td>Provides insight into the effectiveness of an organization’s revenue cycle</td>
</tr>
<tr>
<td></td>
<td>8. Average Treatment Charge</td>
<td>Shows the average amount of facility charges a patient for treatment</td>
</tr>
<tr>
<td></td>
<td>9. Permanent Employee Wages</td>
<td>Tracks the value of wages paid to all full-time employees</td>
</tr>
<tr>
<td>COMMUNICATIONS</td>
<td>10. Number of Media Mentions</td>
<td>Number of times an organization is mentioned in the media</td>
</tr>
<tr>
<td></td>
<td>11. Overall Patient Satisfaction</td>
<td>Calculates a combination of satisfaction levels</td>
</tr>
<tr>
<td></td>
<td>12. Percentage of Patients Who Found Paperwork to be Clearly Written and Straightforward</td>
<td>Demonstrates that an organization has written materials that have clear instructions and patients can understand</td>
</tr>
<tr>
<td></td>
<td>13. Training per Department</td>
<td>Tracks the amount of training each department provider or requires of their employees</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>---</td>
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</tr>
<tr>
<td>14.</td>
<td>Number of Mistake Events</td>
<td>Number of mistakes made in an organization</td>
</tr>
<tr>
<td>15.</td>
<td>Patient Confidentiality</td>
<td>Measures the number of times a patient’s confidential medical records were compromised</td>
</tr>
<tr>
<td>16.</td>
<td>Number of Partnerships with Advocacy Groups</td>
<td>Number of relationships established with other organizations</td>
</tr>
<tr>
<td>17.</td>
<td>Childhood Immunizations</td>
<td>Number of Children who have received immunizations which reflect overall community health</td>
</tr>
<tr>
<td>18.</td>
<td>Number of Educational Programs</td>
<td>Indicates the time and effort involved with educating the public</td>
</tr>
<tr>
<td>19.</td>
<td>Number of Preterm Births</td>
<td>Number of preterm births (under 37 weeks) that have occurred in the region</td>
</tr>
<tr>
<td>20.</td>
<td>Patient wait Times by Process Steps</td>
<td>Amount of time patient waits during their visit to the emergency department</td>
</tr>
<tr>
<td>21.</td>
<td>Time Between Symptom Onset and Hospitalization</td>
<td>The amount of time between when a patient begins experiencing symptoms and when they are hospitalized</td>
</tr>
<tr>
<td>22.</td>
<td>Number of Patients who Leave Without Being Seen</td>
<td>Number of people who leave before seeing a physician</td>
</tr>
<tr>
<td>23.</td>
<td>Medication Errors</td>
<td>Number of times there is an error in prescribing or dosage of medication</td>
</tr>
<tr>
<td>24.</td>
<td>Patient Vs. Staff Ratio</td>
<td>Number of staff available per patient</td>
</tr>
<tr>
<td>25.</td>
<td>Patient Follow-Up</td>
<td>Measures the number of patients who receive follow-up care after their visit to the organization</td>
</tr>
</tbody>
</table>

(Messineo, n.d.)
APPENDIX G

INSTITUTE OF MEDICINE QUALITY MEASURES
The 2006 Institute of Medicine (IOM) report titled Improving the Quality of Health Care emphasized specific strategic efforts to effectively measure quality, including

- The conceptualization of aspects of care to be measured
- Translation of quality of care measurement concepts into performance measures,
- Pilot testing the performance measures to determine their validity, reliability, cost, and feasibility
- Ensuring calculation of the performance measures and their submission to a performance measure repository
- Audits to ensure that the performance measures have been calculated accurately
- Analyze and display the performance measures in a format for understanding by multiple audiences
- Maintain the effectiveness of individual performance measures and sets and policies
APPENDIX H

NATIONAL QUALITY FORUM (NQF) MEASURE SELECTION CRITERIA
The National Quality Forum (NQF) measure selection criteria include

- Importance of the measure
- The scientific acceptability of measure properties (Reliability and Validity)
- Feasibility, usability, and use
- Comparison of related or competing measures
APPENDIX I

DEFINITION OF TERMS
Bricolage- small, micro-incremental processes of innovation by resources at hand challenging existing practices (Krontoft et al., 2018)

Data Analytics- The systematic study and analysis of data interpreted by transforming numbers and metrics into actionable ideas and insights (Fox, 2020).

Innovation- a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) of brought into use by the unit (process) (Oslo Manual, 2018, p. 60)

Innovation Culture- A culture where a group of peoples’ shared values, customs, and assumptions are conducive to new ideas and organizational change (Bason, 2010).

Innovative Work Behavior- The intentional efforts led by individual employees to generate new ideas, get support, and implement ideas to improve the performance of their tasks (Bagheri & Akbari, 2018).

Innovativeness- Behaviors such as openness to new ideas, experimentation, risk-taking, and questioning current processes (Snow, 2019).

Invention – A detailed design that is novel when compared to existing practices.

Key Performance Indicators- The critical indicators of progress toward an intended result. In addition to providing a measure for success and historical performance, KPI’s can point out future outcomes that may offer an early warning of possible problems or potential opportunities.

Outcome Measures- A change in the health of an individual, group of people, or population that is attributable to an intervention or series of interventions as defined by the World Health Organization.

STEMpathy- The ability to combine STEM (science, technology, engineering, math) skills with human empathy (Friedman, 2016).
Wominnovation - innovations that specifically empower women, such as microcredit, mobile telephones, and birth control pills (The Economist, 2010).
| Innovation Use                                      | - Proportion of intended audience ever using innovation  |
|                                                  | - Proportion of intended audience using innovation on daily basis |
|                                                  | - Proportion of intended audience correctly using innovation |
| Clinical Impact                                  | - % change in examined clinical outcome (e.g. lower A1C rate) |
|                                                  | - % change in service utilization (e.g. ED visits) |
|                                                  | - % change in knowledge of provide and/or patients |
| Financial Impact                                 | - % and absolute change in cost per unit service |
|                                                  | - % change in organizational revenues |
| User Satisfaction                                | - % change in user experience |

(Endsley, 2010, p. 119)
<table>
<thead>
<tr>
<th>Phases</th>
<th>Steps</th>
<th>Actions and Questions to consider</th>
<th>Measures</th>
</tr>
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</table>
| A) Assess current innovation measurement practices | 1) Identify existing innovation measurement practices | • Can you identify particular patterns?  
• Are you using qualitative or quantitative measures or both?  
• Who uses the measures?  
• What is the frequency of follow-up?  
• Which measures have a direct or indirect effect on innovation?  
• What key innovation measures are linked to incentive systems? | |
| | 2) Assess the current innovation focus and set priorities | • What is the balance between serving existing customers versus targeting new customers?  
• Where is the core innovation focus? Products, services, technology, or a combination of all? | |
| B) Improve Core Innovation Measurement Practices | 3) Develop or improve measures for evaluating the innovation portfolio | • To what extent are explicit strategic choices made in balancing the portfolio  
• Is there a balance between high and low-risk projects, large and small, radical and incremental? | • Proportion of innovation/resources devoted to short and long term initiatives  
• Percentage of projects that result in offering to new markets  
• ROI for new products or services |
| | 4) Develop or improve measures for evaluating the innovation process | • Have measures been identified that reflect input-throughput and output? | • Percentage of projects that lead to revenue  
• Average project performance against targeted schedule  
• Number of projects terminated or stalled |
| 5) Develop or improve measures in evaluating innovation projects | • Is there a reason projects standstill?  
• Is there enough slack for the innovation?  
• Are mechanisms for securing external feedback an integral part of projects? | • Number of new prototypes or new products/services  
• Number of patent applications  
• Time from idea submission to launch  
• Time to profitability  
• Projected cost versus budget  
• Percentage of projects involving third parties |
|---|---|---|
| 6) Set routines for innovation measurement | • Decide the total number of innovation measures  
• Decide which measures can change over time  
• Decide how innovation measures should be linked to incentive systems  
• Decide the frequency of measurement  
• Assign a responsible owner for each measure  
• Make a reasonable time plan for measurement practices  
• Ensure commitment to innovation measurements from key stakeholders  
• Ensure that new innovation measurement practices are known throughout the organization |