The Impact of Technology on Patient-Nurse Relationship
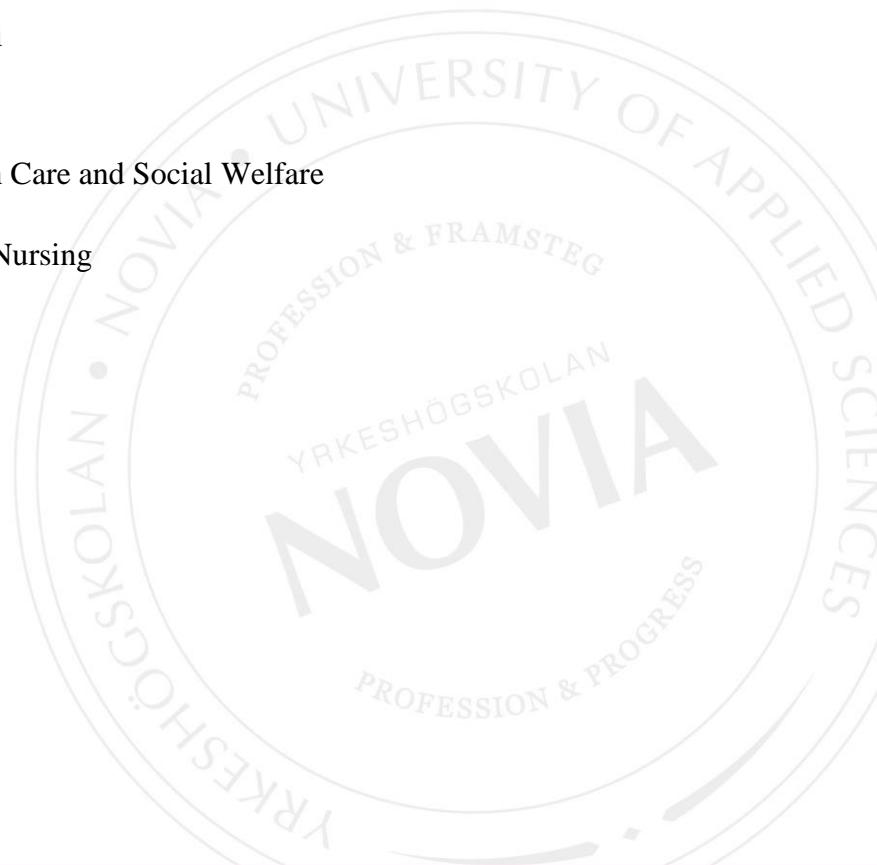
A systematic review

Lilly Akili & Zohra Palani

Bachelor's thesis in Health Care and Social Welfare

Bachelor of Health Care, Nursing

Vaasa, 2023

BACHELOR'S THESIS

Authors: Lilly Akili & Zohra Palani

Degree Program: Bachelor of Health Care, Nursing

Specialization: Nursing

Supervisor(s): Camilla Mattjus

Title: The Impact of Technology on Patient-Nurse Relationship

_____

Date: November 9, 2023   Number of pages: 48   Appendices: 1

_____

Abstract

The aim of this thesis is to study how the use of technology in nursing care affects the relationship between the nurse and the patient. The study also aimed to investigate how ethical principles can be maintained as a nurse when technology is part of the nursing process.

The research was done by using a systematic literature review. Seventeen scientific peer-reviewed articles conducted from different databases. The databases used were EBSCO, CINAHL, Google Scholar, and PubMed. These articles were published ranging from 2008-2023 by researchers around the globe. The insights and information derived from these articles underwent a comprehensive examination to assess both the utilization of integrated technologies in nursing care and their potential impact on the nurse-patient relationship.

As a result, it was found that technology has its benefits and disadvantages. To ensure that the patient-nurse relationship is maintained, nurses must acquire technological competencies. In conclusion, technology has made a significant impression in the health care sector and nursing. Nurses must maintain the code of ethics and have a humanistic approach to caring for people. In the future, it is recommended to continue researching the implementation of technology in nursing care and what it entails for the people receiving care.

_____

Language: English

Key words: *Nursing, Patient-nurse relationship, Technology in nursing, Health technology*

_____

Table of contents

1 Introduction

As the world is constantly changing, so is technology. Today, technology can be seen everywhere, it has revolutionized the daily living of human beings with its many benefits. Technology can either be a great asset or a liability (Menachemi & Collum, 2011). According to the Oxford Language definition, technology is the practical implementation of scientific knowledge (Simpson & Weiner, 1989).

In the coming years, the involvement of technology in health care will continue to rise, and determining if creating technology suitable for nursing care and its many settings will continue to pave the way to an improved relationship amongst nurses and patients. In the use of technology, it is a good idea to find a golden middle ground and apply it in such a way that the advantages outweigh the disadvantages; this also applies to the healthcare sector. Thus, a cultural shift is needed in nursing in order to fast-track into a digitally capable profession. That can be done by investing in education about informatics, research, and practice (Booth, Strudwick, McBride, O'Connor, & López, 2021). In nursing, technology has increased rapidly and can be seen in everyday life. At some point in the technological evolution, we must start thinking of the impact that technology has on nursing. The reason for conducting this research is to see if technology is making life easier for nurses or if it is a hindrance and affecting the patient-nurse relationship (Booth, Strudwick, McBride, O'Connor, & López, 2021).

For many professionals, it was good to integrate technology with healthcare. However, what was considered negative was the lessened face-to-face meetings, technical issues, professionals' and clients' insufficient promptness and technical skills. This goes to show that utilizing technology can be effortless once the correct training is done (Koivisto, Koroma, & Ruusuvuori, 2018). Moreover, the aging of the population in Finland poses a significant challenge to the healthcare system. According to the preliminary data made by Statistics Finland, one of the largest age groups in Finland are born in 1948 (Statistics Finland, 2021). Meaning almost a quarter of the population is elderly, which is rapidly increasing the demand for nurses. As the population ages, the need for care also increases more than ever before. However, the lack of nurses prevents the demand from being met, and the situation is expected to worsen in the coming years. Nurses already carry a heavy workload, and their working hours are insufficient to provide the elderly with the necessary care and support (Yle, 2021). Due to the shortage of nurses, various measures should be

considered to alleviate the shortage and reduce the workload. The use of technology in nursing has long been on the agenda, and increasing their use has been believed to be beneficial, but to the extent of advancements. Nursing has always been a people-centred job that seeks to nurture individuals to the best of their ability (Niemelä, 2021). That leads us to another question: What happens to the nurse-patient relationship as technology becomes more common, and the impact is greater than before?

2 Background

This chapter will discuss and explain different kinds of themes that are related to the research area of the thesis, elements like technology in different health care settings, patient safety, patient-nurse relationship, and the ethics related to care and nursing practise, giving the reader a proper understanding about this research's content.

2.1 The history of technology

The history of technology goes all the way back to the ancient world to what we have now in the 21st century. The word technology is rooted in an Indo-European word, *tek*. *Tek* is a term used to refer to the building of a wooden house by weaving sticks together. From that word comes the Greek word *techne*, meaning woodworking skills, but soon that was broadened to specialized expertise and knowing how to make that would otherwise not exist. Some philosophical authors like Plato think that medicine was a form of said *techne*. Schatzberg goes on to explain that as the years went on, the technology, that we know now was previously known in the 1850s as mechanical arts or applied sciences. To fill a void, the term technology was coined and later on used to address the material advancements. Technology, or applied sciences or mechanical arts, were considered a form of knowledge, and technology in the 1800s became the highest form of elite systematic knowledge (Schatzberg, 2018). Technology is a manufactured invention and is usually referred to as an artificial enabling tool to suit humankind's interests and goals. The use of scientific discoveries, in addition to implementing scientific knowledge in making utilitarian processes and devices, can be utilized practically with the help of technology (McNeil, 1990).

Modern society would not be able to function without the level of technology they currently have. Humans are dependent on technology, and for a good reason; it is a versatile tool that can be used anywhere and anytime, customizing it for the needed use of the consumer's wishes (Michelsen, 2012). To gain a better understanding of technology, it is beneficial to know its fundamental origins. Technology has always been persistent in the world; and within the nursing profession, it has shown significant growth. Throughout the years, technology has continually advanced and found various applications within nursing care (Agustin, et al., 2020).

Technology can be used in information, communication, and machinery. Nurses have played a critical role in driving technological innovations forward, including the improvement of

patient care and efficiency in nursing practice. Technology is not without fault since there have been challenges accompanied by these technological advancements, such as the need for ongoing training and education for nurses to keep up with (Agustin, et al., 2020).

2.1.1 Health and welfare technology

Health technology is part of a generalized application of knowledge and skills to ensure these devices are essential and critical in solving different healthcare resources and patient quality. Technology has increased the pool of technological devices, procedures, and applications that have increased patient safety, care coordination, and collaboration between patients, their families, and practitioners (Pekkarinen & Melkas, 2019). For instance, modern health technologies include blood and heartbeat rate monitoring devices for acute changes among patients. At the same time, they provide feedback loops to physicians daily. Based on Hofmann (2008), health technology, also known as medical technological tools, is useful in the "*prevention, diagnosis or treatment of illness or disease, or for detecting, measuring, restoring, correcting or modifying*" certain body functioning. As a result, the holistic approaches to healthcare technology have improved resource usage while creating new procedures, skills, and acquisition of medical equipment with a focus on patient safety and quality of care.

One of Finland's healthcare systems' goals is to improve patient welfare, quality of care, and satisfaction; however, disparities in the healthcare sector have affected the long-term welfare of patients, their well-being, and resource usage in society (Mäkelä & Roine, 2009). Welfare technology is a set of medical technologies that aim to improve the welfare of patients and people who need these care services. In healthcare delivery processes, the implementation of policies by the Ministry of Social Affairs and Health (MOH) and the health technology assessment (HTA) has helped develop standards and technologies aiming at protecting patient confidentiality and, at the same time, improving the processes of care delivery under care coordination (Mäkelä & Roine, 2009). Using the Finnish Office for Health Technology Assessment (Finohta) to improve universal healthcare for all has helped streamline the welfare of these patients. This has resulted in the establishment of policies, systems, and the use of technology in a meaningful manner to allow patient convenience. Healthcare systems have portals where patients can access their records, patient data, and follow-up care plans with their respective practitioners.

The following table example of health and welfare technology and the applications are directly from the article *Evidence-related requirements in Swedish public sector procurement of health and welfare technologies – a systematic review*. (Richardson, Landerdahl Stridsberg, & Wamala Andersson, 2022).

Category	Description / Purpose
Safety devices	*Cameras and sensors for fall prevention, tracking/wayfinding*
Memory aids	*Item locators, time orientation calendars, medication robots/reminders*
Social inclusion	*Aids that promote/ease communication and social contact, robot companions*
Daily tasks	*Aids for washing, cleaning, food preparation, incontinence/toilet, dressing*
Health and treatment	*Therapy and rehabilitation devices, self-and remote monitoring, physical activity*
Leisure activities	*Gaming and creativity devices*
Knowledge	*Tools providing education or training; knowledge or skill improvement*

Table 1. HWT applications (Richardson, Landerdahl Stridsberg, & Wamala Andersson, 2022).

2.1.2 Technology and nursing

Nurses use technology daily in their work. The purpose of using technology is to facilitate, improve, ensure, and develop nursing. According to the researcher specialist and physiotherapist Heidi Anttila from the Finnish Institute for Health and Welfare, the principal factors in achieving the benefits of using technology are strengthening customer focus, supporting, and guiding competence, and changing operating practices in work environments. Anttila also adds that the focus should be on the customer's need and ability to perform, not the technology itself (Sailab – MedTech Finland ry, 2021).

As mentioned earlier, the rising technology use in nursing practice, in general, has made nurses' jobs easier but with occurring challenges. Thus, the relationship between nursing and

technology should be taken into consideration to see how it correlates with the situation between nursing and technology regarding the quality of care, patient safety, nurse efficiency, and care satisfaction. The appreciation for technology use in nursing is seen when it elevates patient care and reinforces the nurse's performance of workflow processes. Although nurses have had positive experiences, satisfaction has not always been steady, and there has also been criticism of the use of technology in nursing. For example, circumstances where technology has had a disadvantage have been its slowness, time-consuming, and when technology does not support the workflow process. Therefore, the association between technology and nursing does not always go along with one another. In order to merge nursing and technology together, the proper requirements need to be fulfilled. These requirements consist of people, processes, and technology. The fundamentals of it are technology's incapacity to operate autonomously; instead, it is the individuals who empower the utilization of this process. When these factors are aligned, the project's success is ensured, as well as having a system that helps workflow to be elevated to the next level (Murphy, 2010).

Technological breakthroughs are ever-increasing in a revolutionizing era of health and wellness care. These advancements have affected and significantly shaped the formation and operation of the healthcare industry. The inclusion of electronic health records and robotics has proven to be more accessible and course-altering for the nursing industry. These improvements in health care have been made to ease the nurse's jobs and make care safer and more efficient. This begs the question of whether nurses will keep their relevancy as technology evolves (Pepito & Locsin, 2018).

Even though the development of technology has trailblazed the healthcare industry forward and changed the course for nurses and their practice, robots and artificial intelligence lack the humane aspect of the job. Having robotics makes dispensing medicine, suturing, and taking records and vital signs easier (Pepito & Locsin, 2018). However, it has been proven that machinery functioning with the current development of artificial intelligence is not well equipped to oversee complex emotions like humans due to AI being still in the early stages of development; therefore, it is not yet capable of reading complex human emotions. For nurses, it means they will be able to provide care better than a robot, and communication between the patient and the nurse is more inviting and allows participation while focusing on person-centred care. Artificial intelligence and other technology do not replace the human relationship in nursing; they support it (ICN Code of Ethics, 2021).

2.1.3   Diverse technological paradigms referred in the research

The technologies referenced in this research are mainly related to the communication between the patient and nurse, such as communication technology, health information technology, digital health technologies like medical dispensers and smartphones, eHealth, telecare, and the ethical aspects of these kinds of technologies in nursing.

eHealth is an extensive concept that includes various cost-effective and secure information communication technology (ICT) tools utilized within the healthcare sector. The choice of eHealth modalities depends on the technology's specific goals and purposes in patient care. These modalities can include electronic health records (EHRs), health information systems, remote monitoring, consultation services, self-management tools, and the application of health data analytics. Moreover, the subset of eHealth is mobile health (mHealth), which is linked to mobile phones and apps (WHO, 2018; Svendsen, Tiedemann, & Andersen, 2021).

Communication technology in healthcare involves the use of various formats of technology to communicate. More specifically, it refers to the use of technology for transferring information or messages amongst patients and healthcare professionals. Communication technology also includes tools and machines that are used to send, receive, and process information (Rouleau, et al., 2017). Communication technology can be utilized in a way that helps nurses manage tasks better and more efficiently. Implementing and establishing a care system that considers the digital literacy of the patients and nurses is important to providing care without sacrificing the performance of nurses (Yoo & Lee, 2022).

Health information technology (HIT or Health IT) is a comprehensive concept encompassing various technologies, such as computer equipment, system software, and infrastructure. These technologies are used to record, store, protect, and retrieve clinical, administrative, or financial information in the healthcare sector (Zadvinskis, Smith, & Yen, 2018). HIT as a tool is essential for health care providers due to its ability to enhance patient care, clinical decision-making, and administrative processes. A prime example of HIT is Electronic Medical Records (EMR) for clinical care and Electronic Health Records (EHR) for comprehensive health data, which may contain patient interactions, personal health records (PHR), and data from other healthcare organizations (Sheikh, Bates, Wright, & Cresswell, 2017).

Digital health technologies refer to an expansive range of digital tools and solutions to enhance health and well-being and improve healthcare systems. These tools can include

smartphone apps, wearable devices, remote healthcare platforms (telehealth), symptom-tracking software, online diagnostic tools, and data analysis programs for medical devices like blood pressure monitors (NIHR, 2022). This has been found to be increasingly helpful, especially when considering effective practices and patient confidentiality. Moreover, the formats of digital technologies include artificial intelligence (AI), automation technologies like robotics, assisted living technologies, clinical decision support systems, and electronic health records (EHRs). Digital technologies bring benefits to nursing since they allow nurses to reach their patients and provide care remotely (Booth, Strudwick, McBride, O'Connor, & Solano López, 2021).

Telecare, also known as virtual care, delivers healthcare services digitally. This encompasses a wide range of services, from videoconferencing with healthcare professionals to utilizing wearable devices for monitoring vital signs and activity levels, as well as providing reminders and alerts to the patients. It offers benefits like convenience and accessibility for patients and cost-efficiency for healthcare providers. Remote patient monitoring is a component of virtual care. Challenges like patient engagement, provider burnout, and technical issues exist (Kumar, 2022; Effiong, 2022). Nevertheless, telecare has been found to be effective when trying to increase accessibility, increase management of ailments, and monitor risks and warning signs (Solli, Bjørk, Hvalvik, & Hellesø, 2012; 2015).

2.2 Patient safety

Patient safety means care that does not endanger the patient due to injury, mistake, or forgetfulness that could come from the health care professionals. The patient is always provided with the right kind of care, taking into consideration safety at all stages. Patient safety consists of various components: the safety of treatment, the safety of medication, and the safety of medical devices. Other factors to ensure the safety of the patients are proper use of the environment, equipment, and information systems, as well as efficient flow of information. All of the above are important in achieving safe treatment, and when these steps are followed, there is less room for patient safety to be compromised (Ministry of Social Affairs and Health, 2021).

The promotion of patient safety is also supported and mandated by Finnish law. The government of Finland is responsible for promoting the health, welfare, and security of the citizens. The legislation ***Health Care Act (1326/2010)*** in *Section 8*, is about the high quality

of healthcare operations, care, and patient safety. ***The Health Care Act*** requires the health care unit to develop a plan for quality management and implementation of patient safety but also work in cooperation with social care services (West, 2018). The following *Section 9* further discusses the *patient information register and handling of patient data*. This section deals with the principles and rules of the shared patient information register, which emphasize the availability of patient information to provide comprehensive care while respecting the patient's right to control the use of his information. Patients must be informed about the practices and prohibitions of shared patient data. Information about informing the patient and possible restrictions is recorded in the reports. The municipal association coordinates the patient information register. The units follow the law when processing patient reports (Ministry of Social Affairs and Health, Finland, 2014).

Individuals are also protected by European Union ***Regulation (EU) 2016/679***. ***General Data Protection Regulation (GDPR)*** is an EU data protection regulation that protects the privacy and personal data of EU citizens. It gives individuals more power over their data and obliges organizations to comply with the set rules. The regulation includes the rights to access, correction, deletion, and portability of data. Breaches of the regulation can result in fines (Publications Office, 2016). In addition, the EU has a specific legislation on ***Medical Devices Regulation (EU) 2017/745***, which focuses on setting rules for manufacturers, importers, distributors, and authorized representatives of these devices. The regulation applies to various medical devices, such as diagnostic devices, pacemakers, artificial joints implants, and healthcare software. The aim of the regulation is to increase the safety of patients and medical device use and to improve their safety, quality, and performance in the European Union (Publications Office, 2017).

2.2.1   Patient safety and technology

The ongoing implementation and continuous development of technology can bring challenges to the working environment of healthcare fields. Therefore, the knowledge and skillset the nurses possess must be up to date since nursing as a profession is ever-changing, and it is the nurse's responsibility to develop themselves as an expert in their field and have the acquired competencies. Maintaining competence in nursing can enhance the nursing quality of care, which provides elevation in patient satisfaction (Fukada, 2018). To ensure safety, nurses must also be prepared to adapt to changes in the use of technology, as the use of technology is an increasing and significant part of overall patient safety.

Over the years, the news has highlighted how patient records have been leaked and how patients have been extorted with their confidential data in an attempt for financial gain (Koczkodaj, Masiak, Mirosław, Strzałka, & Zabrodskii, 2019). One cannot mention technology without mentioning the use of personal technological equipment such as phones. Electronics like phones and cameras are a risk to health care, and taking measures to be safe is crucial. The issue of social media and technology is that information can easily be leaked. Healthcare professionals must be careful since the use of healthcare applications is becoming popularized, and it requires more responsibility and self-reflection. The main issue is preserving the privacy of users, and that affects patient safety (Denecke, et al., 2015).

2.3 Nurse-patient relationship

The core and fundamental principle of the nursing profession is the care of the patient, which, without nursing, would not be possible. In other words, humanistic care is essential in nursing—interaction between one person to another: From nurse to the patient. Humanistic care in nursing enables a balanced and consensus patient-nurse relationship, enhancing the quality of nursing care, both the satisfaction of the individual receiving care and the one offering care (Guo, et al., 2023). Effective healthcare delivery is heavily influenced by the social connection between individuals within their shared context. Interpersonal interaction is a crucial element in building the patient-nurse relationship, which plays a critical role in shaping patients' overall experience of being in care (Stoddart & Bugge, 2012).

In the book Interpersonal Relations in Nursing: A Conceptual Frame of Reference for Psychodynamic Nursing, Hildegard E. Peplau describes the nurse-patient relationship as "*a significant, therapeutic, interpersonal process…that make health possible for individuals...*" (Peplau, 1991). The intent of the nurse-patient relationship is for both the nurse and patient to connect, aiming to facilitate in the patient's care and healing (Koloroutis & Trout, 2012).

The nurse-patient relationship is defined as the confidential relationship between the patient and the nurse caring for him or her, and it is the basis of nursing practice. With that being said, the interaction between the patient and the nurse is essential for those working in the social and healthcare fields. Eija Ratikainen's book Building Trust - Building Customer Relationships in the Social and Health Sector says that social and healthcare patient relationships are diverse. The aim is to change, support, rehabilitate, or help to function in everyday life (Raatikainen, 2015).

The nature of the care does not matter in terms of the cooperation between the patient and the nurse because the nurse-patient relationship and interaction are primarily based on trust (Harra, 2014). Trust is one of the pivotal factors for a stable nurse-patient relationship and is the most valued trait of nurses. It is commonly tied together into patient confidentiality and is the major intangible asset that nurses have. Marcella Rutherford's article discusses why trust is essential for nurses and nursing care. Trust is something that builds the public's trust. Trust and other nursing values are linked to morality and ethics while working as a nurse (Rutherford, 2014). Other fundamental characteristics of the nurse-patient relationship also contribute to the overall quality of relations with the patient, their families, and the care. These attributes are empathy, presence, connection, authenticity, and reciprocity. The purpose of the nurse-patient relationship is to be a helping process throughout the care and treatment. Components such as communication, attentive listening, respect, and confidentiality must be present for the relationship to be based on equality and closeness. The health care outcomes are improved when all aspects are being met (Allande-Cussó, Fernández-García, & Porcel-Gálvez, 2022).

In Finland, the nurse's job is to provide care fairly, treating each patient equally as an individual where the care and treatment meet the needs regardless of the patient's background. This includes everything from the patient's health problem, culture, religion, native language, age, gender, race, skin colour, political opinion, and economic or social status. All these factors need to be taken into consideration when caring for the patient without violating the patient's dignity, beliefs, and privacy (West, 2018).

As much as nurses follow the protocols and try to maintain a healthy nurse-patient relationship, nurses themselves also want to be respected and valued as a person and the traits that come with it. In the article *Influence of nurse-patient relationship on hospital attendance…*, most of the participants indicated that patients should display an equally good attitude and behaviour towards the nurses as the nurses show them. They felt that better communication between the nurses is crucial for improving the nurse-patient relationship. Regular evaluations of the patient's experiences, as well as the experiences of the nurses, should be conducted so that gaps in communication and interactions between nurses and patients can be corrected (Konlan, et al., 2021).

2.4 Nursing and the ethical code of conduct

The nurses ethical code of conduct includes the elements of the code of conduct like nursing practice, profession, global health, and requiring care or service. This code was made to help nurses turn practice into action. The ICN code of ethics works as a framework for nurses and other health care professionals. The purpose of the code is to provide guidance in relation to nurses' roles, duties, responsibilities, and professional accountabilities relating to the separate roles' nurses assume (ICN Code of Ethics, 2021).

A nurse's job is to provide care to people in need, promote health, and prevent illnesses. The important aspects of being a nurse are person-centred care, privacy, professionalism, equity, and confidentiality. Being competent, capable of self-reflection, and fit to practice is unbelievably valuable (ICN Code of Ethics, 2021).

Essential Nursing Values	
Altruism	*Is a concern for the welfare and wellbeing of others. In professional practice, altruism is reflected by the nurse's concern and advocacy for the welfare of patients, other nurses, and other healthcare providers.*
Autonomy	*Is the right to self-determination. Professional practice reflects autonomy when the nurse respects patients' rights to make decisions about their health care.*
Human dignity	*Is respect for the inherent worth and uniqueness of individuals and populations. In professional practice, concern for human dignity is reflected when the nurse values and respects all patients and colleagues.*
Integrity	*Is acting in accordance with an appropriate code of ethics and accepted standards of practice. Integrity is reflected in professional practice when the nurse is honest and provides care based on an ethical framework that is accepted within the profession.*
Social Justice	*Is acting in accordance with fair treatment regardless of economic status, race, ethnicity, age, citizenship, disability, or sexual orientation.*

Table 2. Essential Nursing Value directly from AACN (American Association of Colleges of Nursing, 2008).

2.4.1 Ethics in nursing and technology

Nursing ethics refers to ethical issues that emerge in nursing practice. Nursing ethics touch on many core values. Some of those core values are health, dignity, compassion, respect, equity, and inclusivity. Some values are obligations, and some are attributes of character. The aspects of the code circle around people in need of care, nursing practice, nursing as a profession, and global health (ICN Code of Ethics, 2021).

The ethical principles of healthcare and nursing care are relevant for many reasons. They influence the formation of health policy, the declaration of patients' rights, and the public debate about health care. Recognizing and addressing the ethical implications of healthcare technology is vital. Nursing leaders must ensure that nurses are competent to use technology ethically that supports patient recovery and autonomy. This requires ongoing training and commitment to codes of ethics to stay up to date with the latest health technology developments. Implementing ethically developed technology in practice requires cross-cultural research and strategic support as part of a more comprehensive research program. The benefits of health technology and potential ethical issues must be considered to ensure that it serves patients' best interests (Leino-Kilpi, 2009).

2.4.2 Ethical code of conduct

Codes of ethics have been made to give the right kind of path to conduct principles to the professions in each field. In nursing care, the code of ethics is the guideline that nurses adapt to their work and practice. Nurses must work accordingly and always remember to take all into consideration concerning people beliefs, cultures, and social norms (ICN Code of Ethics, 2021).

The code of conduct includes providing people-focused, culturally suitable care that respects human rights and is considerate of people's values, customs, and beliefs without prejudice and unjust discrimination (ICN Code of Ethics, 2021).
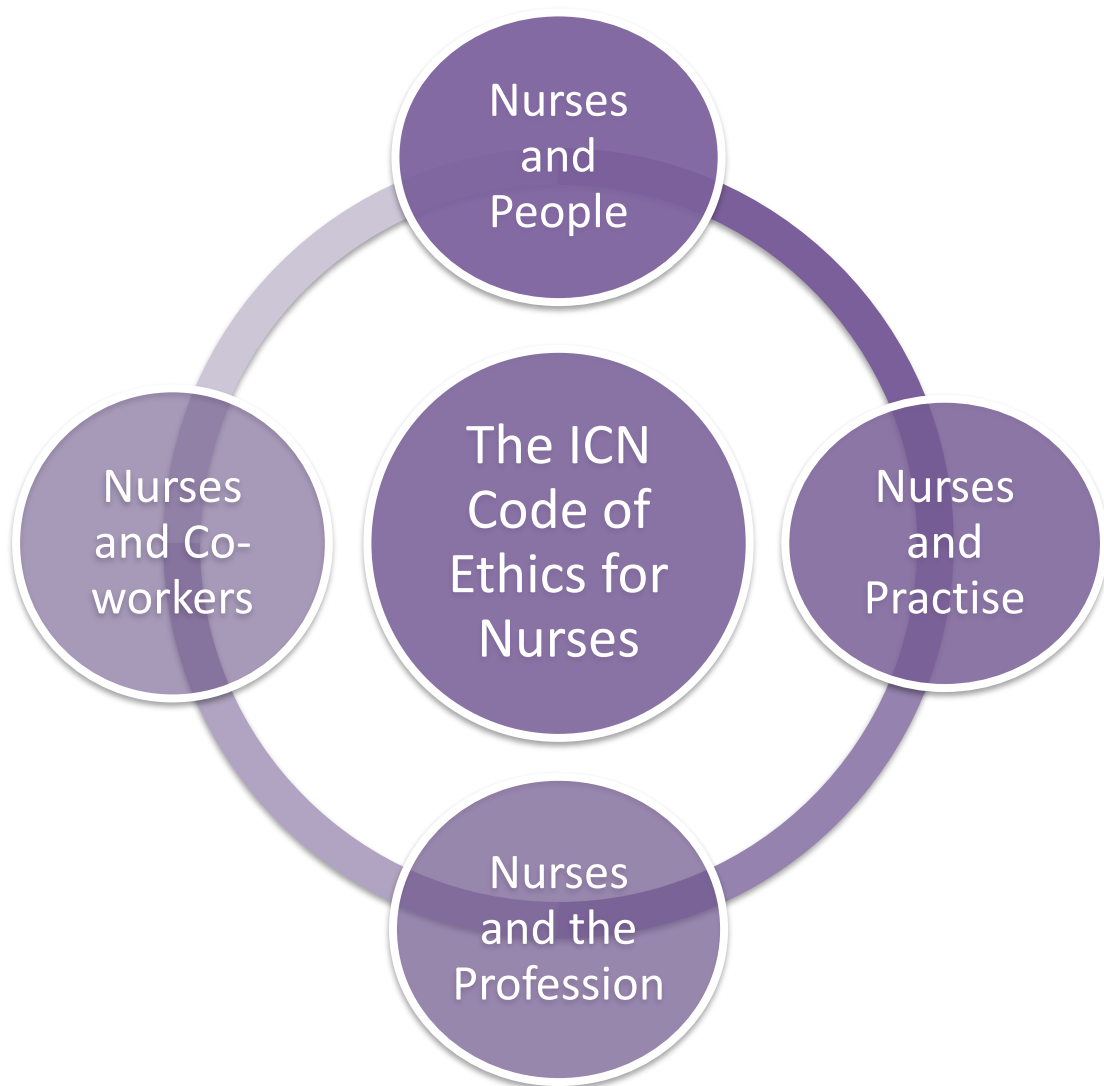
Figure 1. Four principal elements of the ICN CODE (International Council of Nurses, 2015)

3 Aim of the study

The aim of the study is to bring awareness and gain better understanding of how technology affects the patient-nurse relationship, to benefit the quality of nursing care.

3.1 Research Questions

The research questions are:

1. How would technology affect the patient-nurse relationship?

2. How do the nurses maintain the nursing code of ethics when technology is involved?

4   Theoretical framework

In this research, the theoretical framework is based on nursing theory, and it is to guide and shape the study. The nursing theory chosen for this research is Technological Competency as Caring in Nursing by Rozzano Locsin, which is applied to provide a specific perspective when the study's results are analysed. Of all the theories available, this theory appeared to be the most suitable for this study because of the theory's understanding of the importance of the patient-nurse relationship in nursing, emphasizing essential factors such as caring, technology, human touch, and a holistic approach to nursing practice.

4.1   Technological Competency as Caring in Nursing

The theoretical framework for this study is based on the Technological Competency as Caring in Nursing (TCCN), created in 2005 by Rozzano C. Locsin. Locsin's theory TCCN is the only middle-range nursing theory that particularly focuses on *"Technological knowing within the harmonious coexistence of nursing, technology, and caring."* The focal point of the theory is *"knowing persons"* and the other supporting key factors are technological knowing, designing, and participative engaging. The fundamentals of Locsin's theory is to know the "persons" while implementing a variety of technological advancements during the caring process. The combination of caring and technology can be challenging when conceptualized. However, when caring and technology are seen in harmonious coexistence, complementary caring emerges, advancing the technological competency as *"...an expression for caring in nursing."* (Locsin R. C., 2020).

The literature of Locsin's theoretical model has consistently demonstrated the importance of authentic nursing care, which includes knowing and understanding the person for who they are rather than a patient to care for (Locsin R. , 2010). This type of care requires nurses and physicians to utilize creative and innovative ways to support and appreciate their patients in a way that goes far beyond just treating their ailments. The best way to fulfil these intentions is through providing nurses with the competence necessary to use sophisticated nursing technologies (Locsin R. C., 1998, 2016). It is not only important to provide the education and training necessary for this to take place, but also the encouragement and support for nurses to feel comfortable using various forms of technology. This theory posits that as nursing is defined and reimagined, the need for technology will change significantly, and nurses must be prepared for it (Locsin R. C., 2017). Also mentioned in great detail is how

technology can potentially morph around the needs and requirements of the future of the nursing field.

Accordingly, the TCCN will be essential in understanding how and why technology affects the nurse-patient relationship, both positively and negatively. This model illuminates the congruent relationship and association between technology, technology competence, and caring in nursing practices. The model places a significant emphasis on technology, allowing nurses to fully acknowledge and understand each patient as a unique human by using various technological means. Additively, this model divides technologies into various entities dependent upon the needs of the nursing field, as well as the patients. A huge component of Locsin's model is adequate trust and rapport, between nurses as well as between the nurse and their patients. Significant trust ensures the patient's that they will not be judged or categorized; they will be treated as unique individuals with a complex identity that is exclusive to them. With the trust of the patients and the nursing team, each nurse will be able to individualize how they learn about their patient's needs and desires while implementing innovative technology to aid in the process. This model and the process therewithin elicits the appreciation *of "persons as whole and complete in the moment, human beings as unpredictable, technological competency as an expression of caring in nursing, and nursing as critical to health care."* (Locsin R. C., 2010).

Locsin's theory addresses how nursing is redefined by technology and how technology will morph around the requirements of new-age nursing and the future of patient healthcare concerns. Other issues addressed are the co-dependency of technology in nursing and what would be the aftermath of robots replacing nurses. To what extent can technology such as autonomous robots be utilized, and the ramifications become too grave? (Locsin R. C., 2017).

The model will aid in the understanding of how technology impacts the nurse-patient relationship in a positive and negative manner. The TCCN model will also provide a foundation for accurate understanding and intentional acknowledgment related to nurse's roles and actions. This study will be investigating this relationship by using a qualitative approach, which will provide meaningful information surrounding this topic. The TCCN model is beneficial when using a qualitative approach, as it will guide the study and interpret the results. This study will also enhance the applicability of the TCCN model by providing adequate exposure and implication.

4.2   Assumptions of the theory

The core of Locsin's theory is how technology behaves in a modern world, how persons are seen adjacent to technology, and how nurses can work and exist in a world of technology. In nursing, technology is used widely as an aid, and many processes have been digitalized. Technology is also imperfect, meaning it needs maintenance and constant monitoring to prevent leaks so that patient information and healthcare records are safe. The theory has five assumptions, which, according to Rozzano Locsin, are the pillars of the theory. The theory's assumptions are based on the work of Boykin and Schoenhofer. (Boykin & Schoenhofer, 2001). The five assumptions are:

1. *"Persons are caring by virtue of their humanness."*

2. *"Persons are whole or complete in the moment".*

3. *"Knowing persons is a process of nursing that allows for continuous appreciation of persons moment to moment."*

4. *"Technology is used to know persons as persons moment to moment."*

5. *"Nursing is a discipline and a professional practise".*

4.3   Major concepts of the theory

The major concepts of the theory revolve around patients being seen as persons and technology being secondary in some cases. Technology plays a crucial role in healthcare, and this level of healthcare would not have been achieved without technology's presence and its evolution. There are four major concepts of Locsin's theory, i.e., Nursing, health, environment, and person.

Nursing *"Nurses value technological competency as an expression of caring in nursing".* Locsin's definition of nursing emphasizes the significance of caring and intentionality, and the importance of individuality in defining health as well as respecting each person's unique needs and wishes are highlighted. Therefore, health is personal and differs amongst individuals based on their needs and wishes (Locsin R. C., 2005; 2020).

Health is *" enhancing of personhood"* as per Locsin. Health is not merely the lack of disease or weakness but a holistic state that includes physical, emotional, social, and spiritual

dimensions. It reflects a person's balance and harmony in different areas of life. According to Locsin, health is sought by the patient while the nurse is present in the whole process to accomplish the "health goals" (Locsin R. C., 2005; 2020).

Environment *"Environment as the technological world in which we live in"*. In this case, meaning that the environment is primarily centred by a technological world (Locsin R. C., 2005; 2020).

Human being/Person "*Patient seen as participants in their care rather than object of nurse care"*. Locsin's theory discusses how persons are seen as a "whole" complete in the moment who are constantly growing and changing as the result of one's own unique circumstances and experiences (Locsin R. C., 2005; 2020).

5 Methodology

This research is conducted using a qualitative approach. A qualitative study starts by looking at a broad topic and focusing on a poorly understood or about which has little information. In a qualitative study, there are broad questions that allow answering more narrowed down and specific questions. The main tasks in qualitative studies are sampling, data collection, data analysis, and interpretation (Polit & Beck, 2010).

A qualitative study has criteria concerning what to include and what to exclude when conducting the data collection and analysing the content. The methodology section will also provide an insight to the ethical considerations of the study that is a qualitative systematic review.

5.1 Systematic review

The method used in this thesis is a systematic literature review. A systematic literature review is a scientific research method based on evidence-based practise. In this method, researchers find both published and unpublished studies relevant to the research topic or the question presented and form a scientific conclusion (LoBiondo-Wood, Haber, & Titler, 2019). The best results of evidence-based practice are achieved in such a way that all the necessary evidence has been collected, evaluated, and finally synthesised, after which a conclusion can be drawn. The essential part of the systematic literature review is thorough

documentation of the research process and precise criteria guiding data acquisition (Polit & Beck, 2010).

A systematic review is categorized as a secondary source because it is based on examining and synthesizing previously conducted studies rather than gathering the latest data. In other words, a literature review seeks to provide and evaluate existing research discoveries to understand a specific subject or question comprehensively (LoBiondo-Wood, Haber, & Titler, 2019).

5.2   Data collection

The data collection is gathered from suitable and reliable articles that answer the research questions presented. The process of the collection of the data is a longer process that requires patience and depth of understanding of the materials that are collected. Data collection of data acquisition uses different search engines, where relevant keywords are written in the search bar for research so that suitable articles can be found and then used. It is essential to ensure that the data gathered follow the criteria of trustworthiness and minimize biases. High-quality data collection is crucial in the research setting because it gives a better chance of accuracy for the evidence and conclusion. In addition, the quality of the data and the collection of it affects the overall research quality (Polit & Beck, 2010).

The data was collected using diverse kinds of search engines, which were accessed from Finna, a website that allows one to search from its own search function or to give access to use search engines outside of Finna. Finna also enables unlimited access to both library and electronic materials that Novia University of Applied Sciences offers. The databases used for this research are EBSCO, CINAHL, Google Scholar, and PubMed. By using search engines outside of Finna, one can use more detailed data searches that should be done in the databases' user interfaces, as they have more versatile restriction options.

The preliminary searches for the research were conducted from May 2022 until August 2022. Subsequently, an additional search was undertaken during 2023. The most advanced settings were used when using the search engines, in keywords and phrases that fit the research, getting the right kind of matches in terms of articles that would support the research work and answer the research work's questions. The search terms used were "Nursing" AND "Telehealth", "Patient-nurse relationship" AND "Telenursing", "Nurse-Patient Relations", "Health Technology" AND "eHealth", "Technology Telenursing", "Artificial Intelligence"
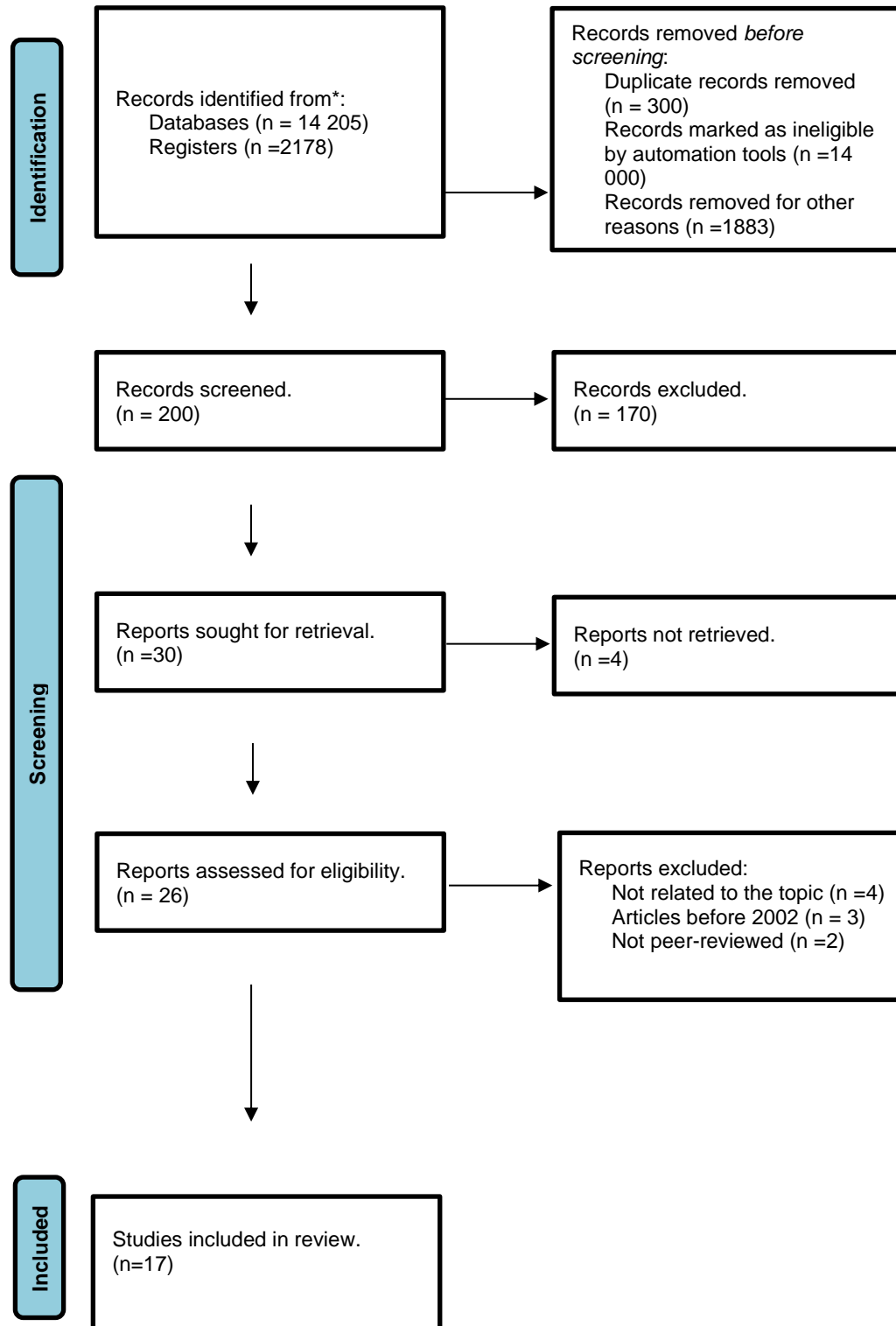
AND "Robotics", "Information Technology" AND "Nurses", "eHealth" AND "Ethics", "Technology in Nursing", "Health Care Technology", "Electronic Health Record", "Nursing Care Ethics".

Documenting the research has proven to be a demanding dilemma, considering the possibility of losing track of the ongoing work. The important aspect when documenting the research process is to keep track of everything done. Following the number of results and articles screened has proven to be challenging but rewarding since it helps maintain the estimate and the pace at which articles are searched and screened. Documentation in this process has been vital because, with each search, the results never come out the same. By maintaining up-to-date awareness of the most important articles and topics, the challenges of presenting repetitive and versatile information can be effectively prevented. In addition, the criteria of data acquisition were to choose articles that were relevant to the topic and provide information that would help find the answers to the research questions. Following the criteria acts as a guideline to ensure that the data acquired is up to date and coincides with the matters discussed in this research. The criteria imposed were that the articles were not more than 15 years old and were peer-reviewed and scientific.

Data sample size is also essential in research because it helps narrow down the integral parts of the thesis. Having a large sampling size allows one to have enough data to draw meaningful conclusions and make valid inferences. Validity in articles helps with avoiding biases and contradictions. Biases in research are not wanted because they affect the analysis process and the results because they will lose their integrity (Polit & Beck, 2018).

5.3 Prisma Flow Chart

PRISMA FLOW CHART

Identification

Records identified from*:
Databases (n = 14 205)
Registers (n =2178)

Records removed *before screening*:
Duplicate records removed (n = 300)
Records marked as ineligible by automation tools (n =14 000)
Records removed for other reasons (n =1883)

Records screened.
(n = 200)

Records excluded.
(n = 170)

Screening

Reports sought for retrieval.
(n =30)

Reports not retrieved.
(n =4)

Reports assessed for eligibility.
(n = 26)

Reports excluded:
Not related to the topic (n =4)
Articles before 2002 (n = 3)
Not peer-reviewed (n =2)

Included

Studies included in review.
(n=17)

5.4   Content analysis

Content analysis is a research method that focuses on the gathered material and the type of it, whether it is the issues, topics, or themes. The important aspects of analysing the collected articles are to discuss the researched topics and whether the results come out as expected or if they challenge the researched topic (Polit & Beck, 2010).

The content analysis method used in this study was inductive content analysis. This study's subject touches on whether and how the use of technology will impact the relationship between the nurse and the patient. When dealing with technology, things like patient safety can be compromised, and in this research, one of the objectives is to find out how to carry out nursing processes while keeping confidentiality. While researching, the steps taken were data collection, sampling, finding the themes, data analysis, and interpretation. In this content analysis, the data collected was from various scientific articles that were connected to the research at hand. Sampling is important for determining the relevance of this research's articles (Kyngäs, Mikkonen, & Kääriäinen, 2019).

5.5   Selection criteria

This section will provide an explanation of the guidelines utilized to determine which scientific articles should be included or excluded from this literature review and what kind of standards were set up for the research to establish the eligibility of scientific articles.

While preparing for this research, inclusion and exclusion criteria were adapted to make the preparation of this thesis clear. Besides the basic inclusion and exclusion criteria, the following criteria were established in alignment with the objective of this thesis, with the intention of selecting only those articles that are relevant to the aim of the study.

The articles found by utilizing the selection criteria varied according to type and in some instances were narrow. To find suitable material to review and analyse the basic criteria had to be altered and broadened. By broadening the inclusion criteria, finding articles on various topics was simple. Some articles were fitting for the study but did not qualify since they were behind a paywall.

Inclusion criteria	Exclusion criteria
Articles that were published in English	Articles published in any other languages than English
Publication year from 2008 to 2023	Publication year before 2008
Articles that were related to the research aim and questions	Articles that were not related to the aim and research question.
Published peer reviewed articles	Articles that were not peer reviewed
Articles that were available and provided full text	Articles that required payment and did not provide full text

Table 3. Inclusion/exclusion criteria

6 Ethical consideration

Every single literature article in this study for the systematic literature review analysis has been collected from reliable sources that are peer-reviewed academic journals. Ethical issues have been considered, and the study has considered the research misconduct and is aware of what it includes. All material used from elsewhere has been recognized correctly, giving credit where credit is due. The results of the study are fairly conducted without distorting and exaggerating the truth (Polit & Beck, 2010). By using the ethical considerations guidelines, the research maintains certain kind of standards for which this thesis is aiming.

In conducting this study, we have complied with the regulations of Novia University of Applied Science and the Finnish National Board on Research Integrity also known as TENK, which is assigned by the Ministry of Education and Culture. It *"…promotes the responsible conduct of research, prevents research misconduct, promotes discussion, and spreads information on research integrity in Finland…"* (The Finnish National Board on Research Integrity TENK, 2020).

7 Results

This chapter of the study addresses and presents the results of a comprehensive systematic review that contained 17 articles. These 17 articles were sourced from different reliable search engines and databases. The articles were inclusive of those that tackle technology in different settings of healthcare and parties experiencing it. The systematic review was conducted in a manner that aligned with the two research questions: 1) How does technology affect the patient-nurse relationship? and 2) How do the nurses maintain the nursing code of ethics when technology is involved? The themes that surfaced pertaining to research question number 1 were: 1) healthy patient-nurse relationships, 2) patient satisfaction, 3) efficacy in communication, 4) caring for specific populations, and 5) the future of nurses. These themes that surfaced pertaining to research question number 2 were: 1) education and training, 2) patient safety concerns, 3) protecting patient privacy, and 4) autonomy. These themes will be presented below in alignment with the respective research questions.

7.1 Technology affecting the patient-nurse relationship

Research question one was, "How does technology affect the patient-nurse relationship?" The following themes surfaced that aligned with this research question: 1) healthy patient-nurse relationships, 2) patient satisfaction, 3) efficacy in communication, 4) caring for specific populations, and 5) the future of nurses. These themes will be explored in depth below.

Patient-Nurse Relationships

When considering how technology impacts the nurse-patient relationship, there are many factors to consider, such as the modality of technology, the extent of technological components, the preference of the patient, and the ability of the nurse to still cultivate and sustain healthy and blossoming patient-nurse relationships. During the systematic review, many articles relayed these same notions with technology and patient-nurse relationships.

For instance, Pols (2010) discussed that it was feared that telehealth would weaken care and reduce the development of personal relationships between nurse and patient. According to the article, the nursing staff is afraid that telecare systems make it challenging to carry out nursing work because the nurse is not physically present at the patient's place. This may lead to missed signs and a lack of human contact, which is regarded as a significant part of good

nursing. There was an example of a homecare nurse who expressed her concern about telecare and emphasized that as a nurse, she knows the condition of patients instinctively as soon as she enters their homes. This ability is central to her work and helps her spot problems that she might not be able to see, smell, or feel through a webcam. For instance, she would be unable to smell the food that is left outside for a long time, indicating the patient's weakened condition. The home care nurse fears that telecare can remove an essential part of the nurse's work and take away the human touch that is so essential in-patient care (Pols, 2010).

Similarly, Farokhzadian and colleagues (2020) mentioned that although there are astonishing benefits, there are also adverse effects from using technology in healthcare settings. One of the major drawbacks is the potential for technology to create a disconnect between providers and patients. Some participants believed that the incorporation of technology took away how much personal interaction they had with the patients. Another adverse effect was the potential for errors. Nurses were concerned about the accuracy and completeness of EHRs, which could lead to medical errors. Additionally, the reliance on technology can lead to a loss of critical thinking skills among healthcare providers as they will rely more heavily on technology to diagnose and treat patients (Farokhzadian, Khajouei, Hasman, & Ahmadian, 2020).

On the contrary, Pols (2010) found the benefits of utilizing the use of telenursing devices helped the nurses learn new things about the individuals they take care of, such as the answers given by the patients via telecare, which provided more information than face-to-face contact could have done in those short sessions. They helped the nurses to find the missing pieces of the patient's well-being that would otherwise be difficult to detect. Telecare allows the nurses to see patients more often and monitor their condition more closely, which brings the nurses and patients closer together. The data collected by the telecare devices helps to detect the patient's problems, enables more intensive treatment, and strengthens the relationship between the nursing staff and the patients (Pols, 2010).

Similarly, Burkoski and colleagues (2019) found that when nurses make direct calls to patients, they improve their rapport with the patient by personalizing and enhancing communication. This method quickly built trust and sustainable relationships that ultimately improved healthcare.

In alignment, Granados-Pembertty and colleagues (2013) highlighted the need for healthcare providers to strike a balance between the use of technology and the importance of human

connection in emergency medical services. The authors impose that healthcare providers should be trained to use technology effectively while still maintaining strong relationships with their patients (Granados-Pembertty & Arias-Valencia, 2013).

Lastly, when considering robots in nursing, one concern is potentially replacing human interaction in healthcare and removing positive nurse-patient interactions from the equation. These relationships are essential in ensuring quality care and should not be replaced completely. These technological pieces should be used in a way that ensures that they are worked in a manner that maximizes their potential benefits while minimizing the risks (Soriano, et al., 2022).

It is important to mention that Abbott and Shaw (2016) discussed how technological trends such as virtual nurse avatars affect the nurse-patient relationship. They found favourable outcomes at times but also noted some adverse components, as the integration of technology in healthcare offers both opportunities and challenges. Healthcare professionals can utilize virtual nursing assistants to enhance patient care, but there is a potential downside in becoming excessively reliant on technology to the point where they lose their human touch. They cautioned that this technology has its limitations concerning nurse-patient relationships and called for a collaboration between nurses and virtual nursing assistants, as this relationship is crucial to the overall care of the patient, as well as the overall projection of healthcare. Abbott and Shaw (2016) also discuss how due to the shortage of nurses; the use of virtual nursing assistants can help lessen the tasks that do not require human intervention.

Patient Satisfaction

When considering how technology impacts patient satisfaction, this can be multifaceted, depending on the nurse and the patient. During the systematic review, it is apparent that some studies have found how technology increases patient satisfaction; whereas other studies have found that it decreases patient satisfaction.

For example, Koltsida and Jonasson (2021) looked at nurses' experiences using information technology in home health care to develop sustainable notions and perspectives. Based on their experiences, the nurses have seen patients express patient satisfaction but also dissatisfaction. Due to these conflicting experiences, the nurses expressed that IT is an addition to ensure the quality of care rather than a focal point of the care. Therefore, IT and its application should be regulated according to the patient's welfare (Koltsida & Jonasson, 2021).

Similarly, Nakrem and colleagues (2018) looked at how digital medical dispensers are efficient in increasing patient satisfaction, as well as improving their healthcare. This was looked at as a single component, but also considered how other technological modalities would also be advantageous in the healthcare field, especially when being used by nurses (Nakrem, Solbjør, Pettersen, & Kleiven, 2018).

Efficiency in Communication

When considering how technology impacts efficiency in communication, studies have found positives and negatives surrounding this. Interestingly, the type of communication seems to determine if this is received positively or adversely. For example, electronic appointment reminders are seen as helpful and welcomed, whereas, discussing a diagnosis or treatment planning via telehealth modalities is not seen as favourable. During the systematic review, several articles seemed to harp on this point.

For instance, Koltsida and Jonasson (2021) found that information technology provides great assistance with communicating with patients in various forms. These authors mentioned that this effective and efficient communication via technology should be regulated according to the welfare of the patient. These authors also noted that this electronic communication, depending on the modality, can either be a good or bad thing for the patients.

Not to mention, Burkoski and colleagues (2019) conducted a study where nurses identified convenience and improved efficiency as key benefits of the smartphone, enabling a timely exchange of information with the interprofessional clinical team and service providers, regardless of their location in the hospital. They also saw the integration of the smartphone with the patient call-bell system as integral to delivering safe care, with the tone-varied alerts serving as a prioritization tool for patient needs. The use of smartphones also had positive effects on the patient-nurse relationship. Direct patient calls to nurses' smartphones improved the nurse-patient relationship by establishing personalized communication and rapid response to calls, which built trust and prevented patients from feeling neglected when receiving an answer (Burkoski, et al., 2019).

Additionally, (Arias Valencia & Granados Pembertty, 2013) reviewed various technologies used in emergency medical services, including electronic health records, telemedicine, and mobile devices. The authors suggest that these technologies can be used to support communication and collaboration between nurses and other healthcare providers. They also

caution that these technologies should not be relied on exclusively as they may not always be dependable or accessible in emergency situations.

Caring for Specific Populations

When considering how technology impacts the care of certain populations, various populations were considered in the literature and discussed in depth related to efficiency and the nurse-patient relationship. Most studies seemed to look at debilitating physical illnesses, rather than mental illnesses. It seems that many of the studies found technology to be advantageous for certain populations.

For example, Soriano and colleagues (2022) explored the use of robots and robotic technologies in the field of nursing, especially in gerontology. The authors began by discussing the challenges that the nursing profession faces, such as a shortage of nurses, aging populations, and increasing demands for healthcare services. The authors then outlined the potential benefits of using robots and robotic technologies in nursing, such as increasing efficiency, improving patient care, and reducing physical demands on nurses (Soriano, et al., 2022).

On a similar path, Lie and colleagues (2019) explored the impact of web-based diabetes self-management programs on the efficacy of treatment, as well as the nurse-patient relationship. The study found that web-based programs for diabetes self-management were effective and favourable, when used in combination with regular contact with the nurse (Lie, Karlsen, Graue, & Oftedal, 2019).

Future of Nurses

When considering how technology impacts the future of nurses, this one was somewhat widespread. There were not necessarily many articles that focused in on this specific topic; however, there were various articles that touched on components of the future of nurses, especially in regard to the evolution of nurse-patient relationships. The systematic review uncovered interesting viewpoints of this aspect of technology in nursing.

For instance, Pols (2010) found that adverse aspects were identified when telenursing was implemented, nurses had to work even harder when providing quality care. This was due to the changes the new system brought along, making the nurses adjust and adapt, such as correcting and contextualizing the information that was received from the devices, making it relevant to the care. The ethical dilemmas that came up were the importance of feeling

safe in relation to identifying problems regarding professional surveillance and how far it should go. The added responsibilities made the patients more passive and made them dependent on the nurses due to nurses monitoring the patients' conditions. Therefore, telehealth was not reducing the workload but adding more to it (Pols, 2010). This is undoubtedly an adverse aspect of telenursing that will need to be addressed to ensure a promising future for nursing through technology.

In a positive light, Locsin (2010) proposed that technology can be combined into caring of patients, seeing them as people of their own, and how technology is an extension and helpful for nurses and in nursing. This perspective provides hope for the nursing field to integrate technology in a meaningful and useful manner. Additionally, Fritz and Dermody (2019) found that the using artificial intelligence (AI) will positively and innovatively transform the nursing field, highlighting the importance of nursing education, research, and clinical expertise. However, they cautioned that ethics should be closely monitored (Fritz & Dermody, 2019).

7.2   Maintaining the nursing code of ethics

Research question two was, "How do the nurses maintain the nursing code of ethics when technology is involved?" The following themes surfaced that aligned with this research question: 1) education and training, 2) patient safety concerns, 3) protecting patient privacy, and 4) autonomy. These themes will be explored in depth below.

Nurses must always have a sense of ethics when it comes to technology. The most important values of nurses have been justice, dignity, privacy, and autonomy. Beyond these core ethical values, nursing is further enriched by additional pillars, including trustworthiness and the crucial responsibility for developing the nursing profession (Rassin, 2008; Pang, Senaratana, Kunaviktikul, Klunklin, & McElmurry, 2009). The technology is a fickle thing to talk about since many things surround it. Technology has many sides to it, and dealing with it involves a multitude of matters to consider.

Education and Training

When considering how nurses maintain the nursing code of ethics, education and training seem to be a huge component. When conducting the systematic review, many studies found the need for extensive training and educational components, to ensure the nurses are up to speed and also adhering to the code of ethics.

For example, Rassin (2008), Pang and colleagues (2009) discuss the importance of nurses possessing competencies in the profession. These competencies enable nurses to practice a higher level of holistic and comprehensive care. These results come from continuous training and a commitment to acquiring knowledge and skills, all while enabling the growth and abilities of the nurse, especially when it comes to keeping up with modern technology. With ongoing individual and professional competency, the nurse ensures knowledge and skills that are up to date (Pang, Senaratana, Kunaviktikul, Klunklin, & McElmurry, 2009).

In addition, another article also discussed the importance of the development of guidelines and education or training components surrounding ethical issues. Skär and Söderberg (2018) provided a comprehensive overview of ethical issues that arise from the use of eHealth technologies in healthcare. The authors identified various themes that represent the ethical concerns of the use of eHealth, including privacy and confidentiality, informed consent, accountability and responsibility, and trust, while also promoting equitable access to health care. The authors recommend the development of guidelines and policies to guide the ethical use of eHealth technologies as well as the need for ongoing monitoring and evaluation of their ethical implications (Skär & Söderberg, 2018).

Furthermore, Zareshahi and the colleagues (2022), as well as Rutledge and Gustin (2021), also chimed in on the need for training and education related to technology and artificial intelligence in the healthcare field, especially for nurses. These researchers mentioned that there is a need for the integration of multiple components in the training and education of nurses to ensure that ability and competence are increased. They claimed that without increased education and innovative training, the use of advanced technology in nursing would not be as seamless as projected (Rutledge & Gustin, 2021; Zareshahi, Mirzaei, & Nasiriani, 2022).

Patient Safety Concerns

When considering how nurses maintain the nursing code of ethics, patient safety concerns are often discussed due to technology being a barrier for caring at times. Several studies have found that patient safety concerns have increased due to the use of technology somewhat replacing the direct role of nurses. On the reverse side, some patient concerns have been alleviated through technology.

For instance, one patient safety concern that was largely documented was the inability to carry out an assessment of care and care needs properly. This was broached by Koltsida and

Jonasson (2021) when reflecting on the nurses' experiences that were discussed. RNs also felt that IT presents possible restrictions and opportunities that pose ethical dilemmas that should be considered. In the care situation, risk awareness was present: In particular, the use of video chats involves risks that require the attention and awareness of the health care professionals. RNs emphasize that using IT, such as video chats instead of physical meetings, could complicate the assessment of care and care needs. It is important that the use of IT and its purpose are constantly discussed in the context of nursing. Nursing staff must be aware of the risks and opportunities associated with the use of IT, so that it can be applied ethically and correctly. This requires open discussion and cooperation so that patients' well-being and the quality of nursing work can remain at the centre (Koltsida & Jonasson, 2021).

Protecting Patient Privacy

When considering how nurses maintain the nursing code of ethics, protecting patient privacy and confidentiality has been deemed to be one of the most significant elements to pay attention to. This point was very apparent during the systematic review, whether indirectly or directly within the articles.

For example, Rassin (2008), Shih and colleagues (2009) discussed the importance of nursing ethical values in human relationships, which encompass characteristics such as mutual respect, trust, and confidence. These values are particularly relevant to aspects like patient confidentiality and privacy. The communication can take any form, whether verbal or not, as long as it is conducted with honesty in both words and actions. In this case, the human relationship is classified as a patient-nurse relationship and should be carried out with mutual respect and understanding. This article exhibited a considerable need for protecting patient privacy through the utmost confidentiality (Pang, Senaratana, Kunaviktikul, Klunklin, & McElmurry, 2009).

Though, a more specific issue that surfaced from the article by Ozair and colleagues (2015) discussed how electrical health records (HRs) improve healthcare accessibility, quality and reduce costs, but they also raise ethical questions. Lack of data security and lack of patient trust can hinder care and cause risks of disclosure of patient data. Managers, healthcare personnel, and decision-makers must address the ethical implications of EHRs and develop related policies, especially as they relate to protecting patient privacy and confidentiality (Ozair, Jamshed, Sharma, & Aggarwal, 2015).

However, although the studies have been proven to improve care when technology is implemented, the nurses raised ethical issues regarding patient safety and electronic health records concerns (Ozair, Jamshed, Sharma, & Aggarwal, 2015). The ethical issues addressed in the clinical settings were regarding an incident at Howard University Hospital, showing that insufficient data security can affect many people. In this case, a hospital employee abused her position and violated HIPAA by gaining access to the patient's names, addresses, and Medicare numbers in order to sell the information. Not only that, but a few weeks prior, the same hospital had a patient's medical data compromised. These kinds of situations have happened not only in this hospital but around the world.

Additively, Dhopeshwarkar and colleagues (2012) found that privacy and confidentiality are important concerns. The ethical concerns behind those two are that they often collect, store, and share sensitive patient data, which must be kept secure to protect patient privacy. They also found that informed consent is essential. It is critical in healthcare, and the principle is also important in the context of eHealth. Patients must be fully informed of the risks and benefits of using eHealth technologies, hence giving consent (Dhopeshwarkar, Kern, O'Donnell, Edwards, & Kaushal, 2012).

Autonomy

When considering how nurses maintain the nursing code of ethics, autonomy was also an ethical piece that was prevalent throughout the systematic review. Autonomy refers to the individual's right to self-determination (American Association of Colleges of Nursing, 2008). Many studies have found this to be increasingly important for nurses and healthcare workers to pay particular attention to. Autonomy can be easily taken away from the patient if the nurses are not cognizant. On the contrary, technology can create an increased sense of autonomy if maneuvered efficiently.

For instance, Soriano and colleagues (2022) discussed some specific applications of robotics in nursing, like robotic surgical assistants, telepresence robots for remote consultations, and robotic exoskeletons that are used for assisting with patient lifting and mobility. It was important for the authors to touch on some of the ethical considerations and concerns like privacy and patient autonomy surrounding the use of robots in healthcare (Soriano, et al., 2022). Robots can easily compromise autonomy, so nurses must work actively to ensure this does not happen.

8   Discussion

This section of the study focuses on the discussion of research findings and the theoretical and methodological perspectives of these findings. The results obtained from this study indicate that pinpointing the impact of technology is complex, and determining the level of satisfaction among individuals is challenging. The reviewed articles have expanded the knowledge that was initially present at the beginning of this study.

8.1   Discussion of the research findings

Through this systematic review, it is apparent that nurse-patient relationships are affected by technology (Pols, 2010; Granados-Pembertty & Arias-Valencia, 2013; Abbott & Shaw, 2016; Burkoski, et al., 2019; Farokhzadian, Khajouei, Hasman, & Ahmadian, 2020; Koltsida & Jonasson, 2021; Soriano, et al., 2022). When discussing technology, it is important to know the risks it brings and how to take preventive measures so that further disasters are avoided. The use of technology is and has been prevalent in health care. Technology, being multi-faceted and multi-purposeful, has proven to be helpful for nurses and beneficial for patients. Thus, the implication of technology needs technological competencies.

Delivering quality care nowadays has components of both humanistic care and digital health technologies that are applied. Using multiple care components allows nurses to provide successful care suited to patients' needs. A good example of a technological device being better of use sometimes is when the nurse feels the patient's body is warmer than usual, and they proceed to measure the temperature with a thermometer. The accuracy of the exact temperature is not achieved if the nurses only use their hands rather than a technological device. Technology and humanistic care are often seen as extremities of each other, which may create assumptions and prevent quality care. By acknowledging technological opportunities and what they bring to the table regarding care, nurses can provide care that guarantees patient and caregiver satisfaction. Finding a perfect balance between healthcare technology and care allows nurses to offer their expertise without losing the human touch that is essentially the core of nursing.

It is not only the nurse's responsibility to be aware of the effects of technology on care, but also the entire department providing care. Malfunctions, such as hospital networks being hacked, glitches in healthcare device systems, issues with battery life, and a lack of knowledge and skills, can pose obstacles and, in the worst-case scenario, be dangerous to

patient safety. Surveillance and control mechanisms should be implemented alongside the use of technology.

In all of the articles that were used, the benefits of technology were seen, and in many of them, the benefits were exceeding the disadvantages by a mile. The most common beneficial factors were experienced in relation to healthcare being more digitalized, and the usage of mobile applications furthered communication remotely (Koltsida & Jonasson, 2021). (Granados-Pembertty & Arias-Valencia, 2013; Burkoski, et al., 2019; Koltsida & Jonasson, 2021) discussed how communication delays were reduced, as well as rapid information transfers conducted in critical care by using a smartphone. Smartphones were described as being able to timely exchange information between all parties involved despite the location of each person. The smartphones with the call-bell system provided safe care in some cases and ensured patient safety. Positive effects were also seen with direct patient calls to the nurses, which included personalized interaction and quick response from the nurse. This built trust and improved the patient-nurse relationship. The use of technology for some patients gave them a sense of independence and feelings of being more involved in their own care.

The code of ethics might be compromised regarding how medical information is managed. Ethics and morals tie into technology through laws and public appearance. The way nurses behave affects the patients; if a nurse is reckless when using technology, that will create distrust between the two parties, which can compromise the care.

Several articles discussed the ethics behind all technologies and what their implications are (Pols, 2010; Dhopeshwarkar, Kern, O'Donnell, Edwards, & Kaushal, 2012; Skär & Söderberg, 2018; Koltsida & Jonasson, 2021). In some articles, it was found that patients enjoyed having technology because it gave them more control over their care, and they had the chance to do more research and ask well-informed questions. The article's findings also presented the negative aspects of implementing technology.

Ethics plays a big part also in the research findings. Many of the themes were surrounded by trust, privacy, and patient autonomy (Rassin, 2008; Shih, et al., 2009; Ozair, Jamshed, Sharma, & Aggarwal, 2015; Skär & Söderberg, 2018; Soriano, et al., 2022). The considerations were also about intrapersonal relationships between patients and nurses. Things like trust, accountability, and responsibility were recurring themes in the articles.

Through Rozzano Locsin's theory (Locsin R. C., 2017), it is clear to see how being caring has connotations to the ethics behind the use of technology. The way a person is viewed is crucial and has proven to have a positive outcome, ensuring they are not considered only an extension of statistics. Maintaining human interaction is something that can prevent technology from taking over. By maximizing the use of technology, patients can experience improved quality of care while maintaining the human aspect of caregiving.

8.2 Theoretical and methodological findings

The Technological Competency as Caring in Nursing was the theory chosen for this study. The theory was derived by Rozzano Locsin, and with this theory, he focuses on how technology can be combined into caring for patients, seeing them as people of their own, and how technology is an extension and helpful for nurses and in nursing (Locsin R. C., 2017). Locsin's theory coincides with the ethics behind nursing and reiterates how technology is not a replacement tool for actual caring in nursing. Another recurring theme is technological competency, which plays a part in how nurses strive to provide a safe space for patients and see them as human beings with dignity, not yet another case.

9 Conclusion

Looking back at the development of technology and the leap that has been made for implementing technology in health and nursing care has been an enormous asset in providing efficient care. The development of information technology and new devices have improved patients' and healthcare professionals' quality of life. Although, throughout the years, concerns have been raised about the world becoming more digitalized and technological. The concerns have usually been about whether robots and artificial intelligence will take over for humans, and some studies and theories address that. Technology has proven to be quite helpful and has advanced the healthcare industry regarding both nurses and patients.

Knowledge of technology management is essential in today's world because the role of technology is so significant, and it is used increasingly, especially in the care sector. Technical competence in care work guarantees diligent care. When the nurse's technical skills are on point, the work result as a whole is successful as well. However, it is essential to maintain human closeness by approaching the person being cared for as an individual, acknowledging their humanity, and refraining from treating them merely as an object to be cared for.

Although diverse kinds of technology are available in health care sector, it does not imply that everything could or should be used in nursing work, nor does it work in the same way for everyone. The importance of possessing technological competency as a nurse becomes evident in meeting the demands of today's healthcare for the people. Technology is involved in care every day, regardless of the circumstances. So, in order for nurses to thrive and provide the best care with technology when in touch with the ones in need of care, more research is needed. Furthermore, there needs to be guidelines and limitations as well as a harmony between technology, nursing, and caring. Nursing practice is still very much about the human touch. Thus, it should not be devalued by overwhelming the care with mass consumption of technology but by combining the two to complement each other for the care the person requires and ensuring the ethical aspects of nursing care are fulfilled. Overall, the study's findings suggest that technology has the potential to transform healthcare delivery and improve patient outcomes. Still, its successful implementation requires careful consideration of the benefits and challenges, the needs and perspectives of all participants involved, and the healthcare professionals' knowledge and expertise when any kind of technological care is performed.

9.1 Limitations

There are a few limitations to this study that should be noted. One apparent limitation is that this systematic review was only comprised of seventeen articles. This limits the depth of the findings, as well as the generalizability. Though the articles displayed a variety of information ranging from positives to negatives of using technology in healthcare, there is still much more information out there to be explored. Another limitation is researcher biases in the creation of themes. Although bracketing and reflective journals were used to ensure personal thoughts did not skew the development of themes, this should still be seen as a plausible limitation.

9.2 Recommendations

More research needs to be done affiliated with technology and its effects on the relationship between patients and nurses. The use of technology in care and nursing is inevitable; however, to ensure the quality of care with all of the technological upheavals happening around the globe, the implementation of technology for nursing must correspond to the care according to the law in terms of individual need, quality, and safety.

It is apparent that many people have not researched or taken a moment to think of what implications technology may have in the future on nurses, patients, and the relationship between them. Finding articles of substance regarding this topic was challenging but eye-opening. Although there were many articles surrounding technology in the health sector, there are not as many articles about the relationship between nurses and patients and the effects of technology as there are about more traditional subjects. There is still room for more research to be conducted and developed about the effects of technology in nursing work when it comes to people versus technology, which is fascinating due to how big of an impact being healthy and having health is for humans and how important nurses' role is.

Similarly, another aspect that stood out across the research findings was the lack of thorough research into how nurses see and feel about technology past the surface level. A few articles superficially explored this; however, more researchers should delve into intentional and purposeful qualitative research to uncover these aspects. Additionally, researchers should consider conducting these various studies with different research methods (i.e., qualitative, quantitative, and mixed methods). This will shed light on the advantages and disadvantages of using technology in nursing, especially pertaining to the components mentioned throughout this article.

10 References

Abbott, M. B., & Shaw, P. (2016, August). Virtual Nursing Avatars: Nurse Roles and Evolving Concepts of Care. *OJIN: The Online Journal of Issues in Nursing, 21*(3), 1-7. doi:https://doi.org/10.3912/OJIN.Vol21No03PPT39.05

Agustin, A., Bhatti, S., Bourne , J., Holmes, L., Hughes, H., Ng, A., . . . Shea, E. (2020). Canadian Journal of Nursin Informatics. *The History of Technology and Innovation in Nursing.*

Allande-Cussó, R., Fernández-García, E., & Porcel-Gálvez, A. M. (2022). Defining and characterising the nurse-patient relationship: A concept analysis. *Nursing Ethics, SAGE Journals, 2*(29), 462–484. Retrieved April 29, 2022

American Association of Colleges of Nursing. (2008). The Essentials of Baccalaureate Education for Professional Nursing Practice. In A. A. Nursing, *The Essentials of Baccalaureate Education for Professional Nursing Practice* (pp. 26-28). Washington, DC: American Association of Colleges of Nursing.

Arias Valencia, M. M., & Granados Pembertty, Y. Y. (2013). Being in front of the patient. Nurse-patient interaction and use of technology in emergency services. *Investigación y educación en enfermería*, 421-432.

Bath, P. A. (2008). Health Informatics:current issues and challenges. *Centre for Health Information Management Research*, 501-518.

Booth, R. G., Strudwick, G., McBride, S., O'Connor, S., & López, A. L. (2021, June 14). How the nursing profession should adapt for a digital future. *The BMJ*, 373. doi:https://doi.org/10.1136/bmj.n1190

Booth, R. G., Strudwick, G., McBride, S., O'Connor, S., & Solano López, A. L. (2021, September 25). *How the nursing profession should adapt for a digital future.* The BMJ. Retrieved from PubMed Central: https://doi.org/10.1136%2Fbmj.n1190

Boykin, A., & Schoenhofer, S. (2001). *Nursing As Caring: A Model for Transforming Practice.* New York: NLN publications.

Boykin, A., & Schoenhofer, S. (2001). *Nursing as caring: A model for transforming practice.* Boston: Jones & Bartlett Learning.

Burkoski, V., Yoon, J., Hutchinson, D., Fernandes, K., Solomon, S., Collins, B. E., & Jarrett, S. R. (2019, May). Smartphone Technology: Enabling Prioritization of Patient Needs and Enhancing the Nurse-Patient Relationship. *Nursing leadership*(32), 29–40.

Cuesta, M., Millberg, L. G., Karlsson, S., & Arvidsson, S. (2020). Welfare technology, ethics and well-being a qualitative study about the implementation of welfare technology within areas of social services in a Swedish municipality. *International Journal of Qualitative Studies on Health and Well-being, Volume 15*(Sub1).

Denecke, K., Bamidis, P., Bond, C., Gabarron, E., Househ, M., Lau, A. Y., . . . Hansen, M. (2015). Ethical Issues of Social Media Usage in Healthcare. *Yearbook of Medical Informatics*, 137-147.

Dhopeshwarkar, R. V., Kern, L. M., O'Donnell, H. C., Edwards, A. M., & Kaushal, R. (2012, September). Health Care Consumers' Preferences Around Health Information Exchange. *Annals of family medicine, 10*(5), 428-434. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3438210/pdf/0100428.pdf

Effiong, U. (2022). *What Is The Difference Between Telemedicine, Telecare, and Telehealth?* Chicago: TELEHEALTH.COM.

Farokhzadian, J., Khajouei, R., Hasman, A., & Ahmadian, L. (2020). *Nurses' experiences and viewpoints about the benefits of adopting information technology in health care: a qualitative study in Iran.* BMC Medical Informatics and Decision Making.

Finlex. (2010). *Health Care Act.* Helsinki: Edita Publishing Oy.

Fritz, R. L., & Dermody, G. (2019). A nurse-driven method for developing artificial intelligence in "smart" homes for aging-in-place. *Nursing outlook, 67*(2), 140–153. doi:https://doi.org/10.1016/j.outlook.2018.11.004

Fukada, M. (2018). Nursing Competency: Definition, Structure and Development. *YAM, Journal of Medical Sciences*(1), pp. 1-7. Retrieved April 30, 2022

Granados-Pembertty, Y. Y., & Arias-Valencia, M. M. (2013). Being in front of the patient. Nurse-patient interaction and use of technology in emergency services. *Investigación y Educación en Enfermería*(31), 421-432. doi:10.17533/udea.iee.17502

Guo, S., Chang, Y., Chang, H., He, X., Zhang, Q., Song, B., & Liu, Y. (2023, January 16). *Patient satisfaction with nurses' care is positively related to the nurse–patient relationship in Chinese hospitals: A multicentre study.* Lausanne: Occupational Health and Safety, a section of the journal Frontiers in Public Health. doi:doi: 10.3389/fpubh.2022.1109313

Harra, T. (2014). *Therapeutic collaboration - Customer participation enabling in occupational therapy.* Rovaniemi: Acta Electronica Universitatis Lapponiensis .

Hofmann, B. M. (2008). Why ethics should be part of health technology assessment. In C. U. Press, *International Journal of Technology Assessment in Health Care* (Vol. 24, pp. 423-429). Cambridge: Cambridge University Press. doi:DOI:10.1017/S0266462308080550

ICN Code of Ethics. (2021). Retrieved from International Council of Nurses: https://www.icn.ch/system/files/2021-10/ICN_Code-of-Ethics_EN_Web_0.pdf

International Council of Nurses. (2015). *THE ICN CODE OF ETHICS FOR NURSES.*

Koczkodaj, W. W., Masiak, J., Mirosław, M., Strzałka, D., & Zabrodskii, P. F. (2019). Massive Health Record Breaches Evidenced by the Office for Civil Rights Data. *Iran J Public Health, 48*(2), 278–288.

Koivisto, T., Koroma, J., & Ruusuvuori, J. (2018). Teknologian hyödyntäminen ja etäpalvelut työterveyshuollossa - ammattilaisten näkökulma. *Finnish Journal of eHealth and eWelfare.*

Koloroutis, M., & Trout, M. (2012). The Purpose of the Therapeutic Relationship. In M. Koloroutis, & M. Trout, *See Me As a Person : Creating Therapeutic Relationships with Patients and Their Families* (p. 28). Bloomington , Minnesota: Creative Health Care Management, Incorporated.

Koltsida, V., & Jonasson, L.-L. (2021, May 01). Registered nurses' experiences of information technology use in home health care - from a sustainable development perspective. *BMC Nursing, 20*(71). doi:https://doi.org/10.1186/s12912-021-00583-6

Konlan, K. D., Saah, J. A., Doat, A.-R., Amoah, R. M., Abdulai, J. A., Mohammed, I., & Konlang, K. D. (2021, February 20). Influence of nurse-patient relationship on hospital attendance. A qualitative study of patients in the Kwahu Government Hospital, Ghana. *Heliyon, 7*(2). doi:https://doi.org/10.1016/j.heliyon.2021.e06319

Kumar, A. (2022). *Digital Healthcare Technology & Innovations: Examples.* Analytics Yogi .

Kyngäs, H., Mikkonen, K., & Kääriäinen, M. (2019). Inductive Content Analysis. In *The Application of Content Analysis in Nursing Science Research* (pp. 14-19). Springer International Publishing AG.

Leino-Kilpi, H. (2009, September). Ethics of healthcare technology. *Nursing Management (through 2013), 16*(5), 8. Retrieved from https://www.proquest.com/scholarly-journals/letters/docview/236927680/se-2?accountid=28773

Lie, S. S., Karlsen, B., Graue, M., & Oftedal, B. (2019). The influence of an eHealth intervention for adults with type 2 diabetes on the patient–nurse relationship: a qualitative study. *Scandinavian journal of caring sciences*, 741-749.

LoBiondo-Wood, G., Haber, J., & Titler, M. G. (2019). Search and Critical Appraisal of the Literature. In G. LoBiondo-Wood, J. Haber, & M. G. Titler, *EVIDENCE-BASED PRACTISE for NURSING and HEALTHCARE QUALITY IMPROVEMENT* (pp. 47-48). Saint Louis: Elsevier.

Locsin, R. (2010). Rozzano Locsin's technological competency as caring and the practice of knowing persons in nursing. In M. C. Smith, *Nursing theories and nursing practice* (pp. 460-471). Philadelphia: F.A. DAVIS Company.

Locsin, R. C. (1998, 2016). Technological Competency as Caring in Nursing: Co-Creating Moments in Nursing Occurring Within the Universal Technological Domain. *The Journal of Theory Construction and Testing, 2*(1), pp. 5-11.

Locsin, R. C. (2005). Technological competency as caring, and the practice of knowing persons as whole. In M. E. Parker, *Nursing theories and nursing practice (2nd ed.).* Philadelphia: F.A. Davis Company.

Locsin, R. C. (2010). Rozzano Locsin's technological competency as caring and the practice of knowing persons in nursing. In M. E. Parker, & M. C. Smith, *Nursing Theories and Nursing Practice* (p. 470). Philadelphia: F.A Davis Company.

Locsin, R. C. (2017). The Co-Existence of Technology and Caring in the Theory of Technological Competency as Caring in Nursing. *Journal of Medical Investigation*.

Locsin, R. C. (2017). The Co-Existence of Technology and Caring in the Theory of Technological Competency as Caring in Nursing. *The Journal of Medical Investigation : JMI, 64*(1.2), pp. 160–164.

Locsin, R. C. (2020). Rozzano Locsin's Technological Competency as Caring in Nursing. In M. C. Smith, *Nursing Theories and Nursing Practise* (pp. 437-438). Philadelphia: F.A. Davis Company.

McNeil, I. (1990). Basic tools, devices and mechanism. In I. McNeil, *An Encyclopedia of the History of Technology* (pp. 1-3). Abingdon-on-Thames: Taylor & Francis Group.

Menachemi, N., & Collum, T. H. (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy*(4), 47-55. doi: 10.2147/RMHP.S12985

Michelsen, K.-E. (2012). History of Technology - A vibrant Middle age science. *The Finnish Quarterly for the History of Technology*, 32–37.

Ministry of Social Affairs and Health. (2021). *Customer and patient safety.* Helsinki: Ministry of Social Affairs and Health.

Ministry of Social Affairs and Health, Finland. (2014). *Health Care Act, No. 1326/2010.* Helsinki: Ministry of Social Affairs and Health, Finland. Retrieved from https://www.finlex.fi/en/laki/kaannokset/2010/en20101326_20131293.pdf

Mohammed, R. G., Mohammed, H. M., & El-Sol, A. E.-S. (2017). New Technology in Nursing Education and Practice. *IOSR Journal of Nursing and Health Science*.

Murphy, J. (2010, November). Nursing and Technology: A Love/Hate Relationship. *Nursing Economic$, 28*(6), pp. 405-8. Retrieved April 29, 2022

Mäkelä, M., & Roine, R. P. (2009). Health technology assessment in Finland. In C. U. Press, *International Journal of Technology Assessment in Health Care* (pp. 102-107). Cambridge University Press. doi:doi:10.1017/S0266462309090497

Nakrem, S., Solbjør, M., Pettersen, I. N., & Kleiven, H. H. (2018, January 15). Care relationships at stake? Home healthcare professionals' experiences with digital medicine dispensers – a qualitative study. *BMC Health Services Research*(18). doi:https://doi.org/10.1186/s12913-018-2835-1

Niemelä, M. (2021). *Routines for robots – technology can improve service and ease the workload in care work.* Espoo: VTT Technical Research Centre of Finland Ltd.

NIHR. (2022). *What is digital health technology and what can it do for me?* National Institute for Health and Care Research. doi:doi: 10.3310/nihrevidence_53447

Ozair, F. F., Jamshed, N., Sharma, A., & Aggarwal, P. (2015, April-June). Ethical issues in electronic health records: A general overview. *Perspectives in clinical research*, 73-76. doi:https://doi.org/10.4103/2229-3485.153997

Pang, D., Senaratana, W., Kunaviktikul, W., Klunklin, A., & McElmurry, B. J. (2009, August). Nursing values in China: The expectations of registered nurses. *Nursing & health sciences, 11*(3), 312-317. doi:https://doi.org/10.1111/j.1442-2018.2009.00468.x

Pekkarinen, S., & Melkas, H. (2019). Welfare state transition in the making: Focus on the niche-regime interaction in Finnish elderly care services. In Elsevier, *Technological Forecasting and Social Change* (Vol. 145, pp. 240-253). ScienceDirect. doi:https://doi.org/10.1016/j.techfore.2018.09.015.

Pepito, J. A., & Locsin, R. (2018). Can Nurses Remain Relevant in a Technologically Advanced Future. *International Journal of Nursing Scienses*.

Peplau, H. E. (1991). Summary of nursing concept. In H. E. Peplau, *Interpersonal Relations in Nursing A Conceptual Frame of Reference for Psychodynamic Nursing* (p. 16). New York City: Springer Publishing Company, Incorporated.

Polit, D. F., & Beck, C. T. (2010). Data Collection Methods. In D. F. Polit, & C. T. Beck, *Essentials of Nursing Research: Appraising Evidence for Nursing Practice* (Seventh Edition ed., pp. 338-361). Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins. Retrieved May 1, 2022

Polit, D. F., & Beck, C. T. (2010). Key Concepts and Steps in Qualitative and Quantitative Research. In D. F. Polit, & C. T. Beck, *Essentials of Nursing Research* (pp. 77-80). Philadephia: Wolter Kluwer Health; Lippincott, Williams & Wilkins.

Polit, D. F., & Beck, C. T. (2010). Resources for Evidence-Based Practise. In D. F. Polit, & C. T. Beck, *Essentials of Nursing Research, Appraising Evidence for Nursing Practice* (pp. 52-56). Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins.

Polit, D. F., & Beck, C. T. (2018). Frameworks of quality criteria. In D. F. Polit, & C. T. Beck, *Essentials of nursing research. appraising evidence for nursing practice* (pp. 491-493). Philadelphia: Wolters Kluwer Health.

Polit, F. D., & Beck, C. T. (2010). Research Misconduct. In F. D. Polit, & C. T. Beck, *Essentials of Nursing Research: Appraising Evidence for Nursing Practise* (Seventh Edition ed., pp. 150-157). Philadelphia: Wolters Kluwer Health | Lippincott Williams & Wilkins.

Pols, J. (2010, January 10). The Heart of the Matter. About Good Nursing and Telecare. *Health care analysis*(18), 374–388. doi:https://doi.org/10.1007/s10728-009-0140-1

Publications Office. (2016). *REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.* Luxemburg: Publications Office of the European Union.

Publications Office. (2017). *REGULATION (EU) 2017/745 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.* Luxembourg: Publications Office of the European Union.

Raatikainen, E. (2015). Trust increases vitality. In E. Raatikainen, *Building Trust - Building Customer Relationships in the Social and Health Sector* (pp. 17-20). Jyväskylä: PS-kustannus.

Rassin, M. (2008, September). Nurses' professional and personal values. *Nursing Ethics, 15*(5), 614-630. Retrieved from https://journals.sagepub.com/doi/epdf/10.1177/0969733008092870

Richardson, M. X., Landerdahl Stridsberg, S., & Wamala Andersson, S. (2022, March 17). Evidence-related requirements in Swedish public sector procurement of health and welfare technologies - a systematic review. *BMC health services research*, 357-357. doi:https://doi.org/10.1186/s12913-022-07723-x

Rouleau, G., Image, O., Gagnon, M.-P., Côté, J., Payne-Gagnon, J., Hudson, E., & Dubois, C.-A. (2017). *Impact of Information and Communication Technologies on Nursing Care: Results of an Overview of Systematic Reviews.* Journal of Medical Internet Research, JMIR Publications. doi:10.2196/jmir.6686

Rutenberg, C., & Oberle, K. (2008). Ethics in Telehealth Nursing Practice. *Sage Journal*, 342-348.

Rutherford, M. M. (2014). The Value of Trust to Nursing. *Nursing Economics*, 283-288.

Rutledge, C. M., & Gustin, T. (2021, January 31). Preparing Nurses for Roles in Telehealth: Now is the Time. *OJIN: The Online Journal of Issues in Nursing*.

Sailab – MedTech Finland ry. (2021). *How are nursing, rehabilitation and health technology combined? - Seminar reminded of the presence of health technology throughout healthcare.* Helsinki: Sailab – MedTech Finland ry.

Schatzberg, E. (2018). *Technology: Critical History of a Concept.* Chicago: University of Chicago Press.

Sheikh, A., Bates, D. W., Wright, A., & Cresswell, K. (2017). Health Information Technology and Value. In *Key Advances in Clinical Informatics : Transforming Health Care Through Health Information Technology* (p. 99). Elsevier Science & Technology.

Shih, F.-J., Lin, Y.-S., Smith, M. C., Liou, Y.-M., Chiang, H.-H., Lee, S.-H., & Gau, M.-L. (2009). Perspectives on professional values among nurses in Taiwan. *Journal of clinical nursing, 18*(10), 1480-1489. doi:https://doi.org/10.1111/j.1365-2702.2008.02728.x

Simpson, J., & Weiner, E. (1989). *The Oxford English Dictionary (second edition).* Oxford University Press.

Skär, L., & Söderberg, S. (2018). The importance of ethical aspects when implementing eHealth services in healthcare: A discussion paper. *Journal of advanced nursing , 74*(5), 1043-1050.

Solli, H., Bjørk, I. T., Hvalvik, S., & Hellesø, R. (2012). Principle-based analysis of the concept of telecare. *Journal of advanced nursing, 68*(12), 2802–2815. doi:https://doi.org/10.1111/j.1365-2648.2012.06038.x

Solli, H., Hvalvik, S., Bjørk, I. T., & Ragnhild, H. (2015). Characteristics of the relationship that develops from nurse-caregiver communication during telecare. *Journal of Clinical Nursing, 24*, 1995-2004.

Soriano, G. P., Yasuhara, Y., Ito, H., Matsumoto, K., Osaka, K., Kai, Y., . . . Tanioka, T. (2022). *Robots and Robotics in Nursing.* MDPI: Healthcare.

Statistics Finland. (2021). *Preliminary population statistics.* Helsinki: Statistics Finland.

Stoddart, K., & Bugge, C. (2012). Uncovering the features of negotiation in developing the patient-nurse relationship. *British Journal of Community Nursing*, 77–84.

Svendsen, M. T., Tiedemann, S. N., & Andersen, K. E. (2021, May 18). Pros and cons of eHealth: A systematic review of the literature and observations in Denmark. *SAGE Open Medicine, 9*. doi:https://doi.org/10.1177/20503121211016179

The Finnish National Board on Research Integrity TENK. (2020). *TENK.* Helsinki: The Finnish National Board on Research Integrity TENK.

Valvira. (2018). *Patient status and rights.* Helsinki: The National Supervisory Authority for Welfare and Health (Valvira).

West, J. (2018). *Finnish patient safety/guidelines and patient safety in World Health Organization Learning material.* Helsinki: Metropolia University of Applied Sciences.

WHO. (2018). *Classification of Digital Health Interventions: A Shared Langauge to Describe the Use of Digital Technology for Health.* Geneva: World Health Organization.

Yle. (2021). *Expert: Finland needs 30k more healthcare workers by 2030.* Helsinki: Yle. Retrieved from https://yle.fi/a/3-11782213

Yoo, H. J., & Lee, H. (2022). *Critical role of information and communication technology in nursing during the COVID-19 pandemic: A qualitative study.* Journal of Nursing Management.

Zadvinskis, I. M., Smith, J. G., & Yen, P.-Y. (2018, June 26). Nurses' Experience With Health Information Technology: Longitudinal Qualitative Study. *JMIR medical informatics, 6*(2). doi:https://doi.org/10.2196/medinform.8734

Zareshahi, M., Mirzaei, S., & Nasiriani, K. (2022, March 25). Nursing informatics competencies in critical care unit. *Health Informatics Journal, 28*(1). doi:https://doi.org/10.1177/14604582221083843

Appendix 1: An overview table for the articles included in the systematic review

No	Authors & year	Article title	Aim	Method	Results
1.	Miriam Bowers Abbott, Peggy Shaw. 2016.	Virtual Nursing Avatars: Nurse Roles and Evolving Concepts of Care	To discuss the role of virtual nursing avatars, their impact on the nurse-patient relationship and the future of nursing avatars.	The used methods were analysing 16 different articles and journals to determine the implication of technology like virtual nursing avatars.	The future of the use of technology seems hopeful in the sense of collecting information and discharging patients but the abilities of said avatars are limited. The avatars can help nurses with tasks but essentially, they cannot replace the human touch that nurses provide.
2.	Mahin Zareshahi, Samaneh Mirzaei, and Khadijeh Nasiriani. 2022.	Nursing informatics competencies in critical care unit	The aim of the study is to define the nursing informatics competencies required for effective care in intensive care units (ICUs) by utilizing the Delphi method and expert input.	The study uses the Delphi method with 30 expert panellists to identify nursing informatics competencies for ICU nurses, categorized into basic computer skills, software proficiency, and specific nursing informatics skills.	The study's results highlight the essential nursing informatics competencies required for ICU nurses to effectively manage patient care in the modern healthcare environment. These competencies range from basic computer skills to specialized nursing informatics skills and are crucial for providing safe and efficient care.
3.	Carolyn M. Rutledge & Tina Gustin. 2021.	Preparing Nurses for Roles in Telehealth: Now is the Time.	To give an understanding of the evolution of telehealth nursing, roles in telehealth accessible to nurses, and necessary education to prepare the nurse to engage and promote telehealth.	Overview of the pandemic and nursing skills related telehealth.	The pandemic has highlighted the need for nurses to adopt telecare. Lack of skills regarding telehealth within nurses. The importance and need to incorporate nursing curricula into telehealth education can produce qualified nurses, improved patient care, formal specialization, enhanced collaboration with telehealth, and financial efficiency.
4.	Vanessa Burkoski, Jennifer Yoon, Derek Hutchinson, Kevin Fernandes, Shirley Solomon, Barbara E Collins, Scott R Jarrett. 2019.	Smartphone Technology: Enabling Prioritization of Patient Needs and Enhancing the Nurse-Patient Relationship	To investigate how nurses see the effects of smartphone devices in strengthening the nurse-patient relationship and improving the flow of nursing work.	The used methods were semi-structured focus groups and interviews to find out nurses' experiences with smartphone technology. The interviews were recorded, transcribed, and analysed using content analysis to identify themes.	The interviews revealed nurses' views on the benefits and challenges of using a smartphone in a clinical setting. Nurses mentioned time management, convenience, prioritization, patient safety, and improved nurse-patient relationship as advantages. To avoid perceptions, education on this is needed for both the patient and their families.
5.	Sigrid Nakrem, Marit Solbjør, Ida Nilstad Pettersen, Hanne Hestvik Kleiven. 2018.	Care relationships at stake? Home healthcare professionals' experiences with digital medicine dispensers – a qualitative study	The study focused on evaluating how healthcare professionals experienced the use of digital medicine dispensers in home care and their impact on patient-nurse relationships.	A multi-case studies. Semi structured interviews of 21 healthcare professionals engaged in using the digital medical dispensers. To analyse the data, constant comparative method was also used.	Technology affected patient-caregiver relationships in three ways: The pressure of efficiency weakened relations due to cost concerns. Technology emphasized patient empowerment and safety. Digital health services required supervision, but at the same time offered the opportunity to tailor services to patients' needs.
6.	Yeimy Yesenia Granados-Pembertty & María Mercedes Arias-Valencia. 2013.	Being in front of the patient. Nurse-patient interaction and use of technology in emergency services	To describe how the use of technology affects the nurse-patient relationship from the nurse's perspective.	A qualitative study using grounded theory tools. 20 semi-structured interviews were carried out with nurses working in emergency services in three Colombian municipalities.	The four themes that came up were: • Direct care: High patient interaction. • Fairly direct treatment: Less interaction. • Indirect care - Management: Organizational tasks. • Low interaction - Technology: The role of technology in support. Nurses are essential; technology should support interaction and not replace it. A balance between the importance of technology and its overemphasis.

7	Silje S Lie, Bjørg Karlsen, Marit Graue, Bjørg Oftedal. 2019.	The influence of an eHealth intervention for adults with type 2 diabetes on the patient-nurse relationship: a qualitative study	To find out how an eGSD-based eHealth intervention affect the patient-nurse relationship? - While examining the experiences of patients and nurses.	10 ten patients interviewed with type 2 diabetes and four nurses who delivered the eGSD intervention. Qualitative analysis used on transcribed data.	Two themes found: eGSD improves mutual understanding and flexibility in the relationship. Also, eGSD creates a more fragile relationship. experiences with eGSD are unclear.
8	Jamileh Farokhzadian, Reza Khajouei, Arie Hasman, Leila Ahmadian. 2020.	Nurses' experiences and viewpoints about the benefits of adopting information technology in health care: a qualitative study in Iran.	Focuses on the benefits of incorporating information technology into nursing from nurses' point of view.	Qualitative research approach. 14 nurses chosen from four different hospitals by using purposive sampling method. Semi structured interviews were carried out and then analysed by using conventional content analysis according to Lundman and Griesheim's method.	The nurses' views on the healthcare benefits of information technology were information technology improving services, communication, information management, use of resources and decision-making. Conclusions emphasize supporting nurses and managers in the implementation of information technology, including education and research on experiences.
9	Michal Rassin. 2008.	Nurses' Professional and Personal Values	The aim of the study is to assess both professional and personal values in nurses while identifying the influences on these values.	The study's method consisted of surveying 323 nurses to assess their personal and professional values while also collecting demographic information about them, including gender, age, marital status, education, experience, and nursing expertise.	Nurses prioritize patient dignity, equality, and suffering prevention as their top professional values, with responsibility being central. Personal values highlight honesty, responsibility, and intelligence, while ambition and imagination are rank lower. Significant differences were found in values based on culture, education, experience, position, and expertise. The findings aid in promoting nurses' work aligned with ethical values.
10	Fouzia F. Ozair, Nayer Jamshed, Amit Sharma, Praveen Aggarwal. 2015.	Ethical issues in electronic health records: A general overview	To discuss the numerous ethical issues coming up in the use of the EHRs and the potential solutions.	The article offers a comprehensive overview and discussion of the following topics related to EHRs and EMRs.	EMRs provide both benefits and risks that need management. Essential to maximize EMRs capacities to improve healthcare quality, safety, and efficiency. Key solutions: leadership, teamwork, flexibility, and adaptability.
11	Vicki Koltsida & Lise-Lotte Jonasson. 2021.	Registered nurses' experiences of information technology use in home health care - from a sustainable development perspective	The aim was to find out nurses' experiences of the use of information technology in home health care according to the model of sustainable development.	10 semi-structured lifeworld interviews were conducted with registered nurses. Qualitative content analysis with a deductive approach was used. Sustainable development model used.	The nurses felt that IT use lowered consumption and environmental harm, saved time and resources, and improved the quality of care and patient safety. Nurses mentioned the need to adapt to the patient's well-being and to be more aware of the risks.
12	Jeannette Pols. 2010	The Heart of the Matter. About Good Nursing and Telecare	To analyse the remote monitoring used in the treatment of chronic patients in the Netherlands, evaluating the justification of the concerns and explaining the changes in nursing practices and norms due to the use of remote care devices.	The study interviewed nine specialist nurses and 33 patients in five different telecare projects: home care organization, hospital wards, the Rehabilitation Clinic, regional network of general practices. Other participants were interviewed as well.	According to the study, telecare does not implicate fear of negligence or endangering relationships, but the opposite, increases more frequent and specialized contacts between nurses and patients.

13	Gil P. Soriano, Yuko Yasuhara, Hirokazu Ito, Kazuyuki Matsumoto, Kyoko Osaka, Yoshihiro Kai, Rozzano Locsin, Savina Schoenhofer, Tetsuya Tanioka. 2022	Robots and Robotics in Nursing	The aim is to explore nursing robots and robotics, differences between human and robot partnerships, examples, and challenges.	The study analysed previous frameworks and reviewed them from a nursing standpoint.	Technology, artificial intelligence, and care robotics make healthcare more efficient. Robots support caregivers, but replacing human care requires further research. It would be important to develop the Treatment Status and Reaction databases. Artificial intelligence and robotics could show empathic signs, but their implications for theories of care need a deeper understanding.
14	Dong Pang, Wilawan Senaratana, Wipada Kunaviktikul, Areewan Klunklin, Beverly J McElmurry. 2009.	Nursing values in China: the expectations of registered nurses	The aim of this study was to find out the most significant professional values of Chinese nurses and their manifestations in the current healthcare environment.	Data from 29 nurse experts in China, were gathered through semi-structured individual interviews and focus groups. The collected data were then subjected to thematic analysis for interpretation and understanding.	The study identified seven core professional values in Chinese nursing: altruism, caring, trustworthiness, dignity, commitment to professional growth autonomy, and justice. The values generally align with international nursing standards but are shaped by cultural and socioeconomic factors. The findings can help develop a culture-sensitive nursing values scale in China.
15	Fu-Jin Shih, Yaw-Sheng Lin, Marlaine C Smith, Yiing-Mei Liou, Hsien-Hsien Chiang, Szu-Hsien Lee, Meei-Ling Gau. 2009.	Perspectives on professional values among nurses in Taiwan	This study aimed to determine the key modern nursing values that hold significance for nursing clinicians and educators in Taiwan.	A qualitative descriptive study was conducted in Taiwan involving 300 registered nurses, including 270 nursing clinicians and 30 faculty members. The researchers conducted 22 focus-group interviews and analysed the data through systematic content analysis.	The study found six core nursing values: encompassing humanistic care, competence, and holistic care, fostering growth, experiencing the give-and-take of caring for others, receiving fair compensation, and health promotion. Participants' perspectives on nursing values were shaped by four factors: multiple viewpoints, self-discovery, professional competence, and self-actualization.
16	Rina V. Dhopeshwarkar, Lisa M. Kern, Heather C. O'Donnell, Alison M. Edwards, and Rainu Kaushal. 2012.	Health Care Consumers' Preferences Around Health Information Exchange	The aim was to gain better understanding on consumer preferences concerning the privacy and security aspects of Health Information Exchange (HIE).	The study was conducted by using a cross-sectional survey in the Hudson Valley of New York State, where patients must actively grant permission for their data to be utilized within (HIE). The information was gathered by random digit dial telephone survey from the residents regarding their opinions on (EHR) and (HIE).	The study highlighted consumers wanting more control over their health information in (HIE) systems. They seek data control, encompassing access, privacy safeguards, monitoring, storage choices, information sharing preferences, and health data selection. Consumers reject auto-inclusion, preferring manual approval and data selectivity in HIE. Findings should be used as guide on how to use and develop (HIE).
17	Lisa Skär, Siv Söderberg. 2018.	The importance of ethical aspects when implementing eHealth services in healthcare: A discussion paper	The study's objective is to explore the significance of ethical considerations when eHealth services are implemented within the healthcare sector.	Discussion paper	The results highlight the ethical challenges in implementation of eHealth, stressing the need for patient-centred solutions and healthcare professionals' ethical responsibility. Further research is crucial to gain more knowledge and to improve the ethical aspects of eHealth services in healthcare.