Technology and its ethics in nursing and caring journals: An integrative literature review

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Abstract
Background: Over the past 20 years, the impact of technology has increased significantly in health care. The diversity of technology is growing and its knowledge scattered. The concept of technology is ambiguous in caring and nursing sciences and its ethics remains unidentified.
Aim: To find evidence on how the concept of technology and its ethics are defined in caring and nursing sciences and practice. The purpose of this study is to describe and summarize the concept of technology and its ethics in the past nursing and caring literature.
Method: The integrative literature review of the past nursing and caring literature. The data were collected from caring and nursing journal articles from 2000 to 2013 focusing on technology and its ethics. The results were summarized and themed.
Results: Technology as a concept has three implications. First, technology is devices and products, including ICT and advanced, simple and assistive technology. Second, technology refers to a process consisting of methods for helping people. Third, technology as a service indicates the production of care by technology. The ethics of technology has not been established as a guiding principle. Some studies excluded ethical reflection completely. Many studies discussed the ethics of technology as benefits such as improved communication and symptoms management, and the simple use of e-health services whilst others remained critical presenting ethical problems such as unwillingness and the inability to use technology, or conflicts with human aspects or questions of inequality.
Conclusion: In conclusion, this study indicates that technology as a concept is described diversely. The relation between technology and ethics is not a truism. Despite some evidence, more is needed to promote ethical care when using technology.

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Introduction

The need for research on technology has arisen over the past 20 years because the world has changed to the world of technology.[1,2] Technology in care has been used to support or compensate the daily living activities, help interaction, educate patients, and enable the use of healthcare services.[3,4] The concept of technology has been used varyingly, including caring technology,[5] nursing technology,[6] well-being technology, information technology,[7] telenursing,[8] and technology in care named by a specific device or area of nursing or medicine.[9,10] An array of complex equipment in care has increased, and both patients and nurses are expected to use it.[11,12] Utilizing technology in self-care is part of the health policy highlighting people's activity, independence, and responsibility.[13,14] Information communication technology (ICT) and its applications are seen as tools to engage patients in self-care,[15,16] but the views on the individuality of human beings and their experiences have not been considered.[2]

The devices in healthcare are subjected to a very precise health technology assessment (HTA), which analyses technology quantitatively based on experimental studies. The assessments emphasize the technical safety of devices, the effectiveness of healthcare interventions, and cost-effectiveness. The evidence of the assessment is multidisciplinary, but it is mainly based on positivistic research methods.

In the Western world, governments have a constantly growing apprehension about the costs of healthcare and assuring the sufficiency of workforce. A common vision views technology as a solution to these problems. Simultaneously, there is considerable apprehension about the effects technology has on transforming care, relationships between human beings, nurses and patients, and even the individual human being.[17] The technological rationality and technological society thinking has brought up the question about the ethics of technology in human sciences.[2] When looking for the best evidence of technology in science and healthcare, it is important to have a comprehensive view of the use of the concept and the phenomenon. Caring science presents a complementary view on the evidence of technology by highlighting the concept and the phenomenon from the viewpoint of caring science. At the core of caring science are ethics, human good, and patient's absolute dignity.[18–20] Consequently, the foundation for this study is built on caring science.

The multiplicity of technology increases in research and healthcare like a "tidal wave" causing scattered knowledge. The purpose of this study is to describe and summarize the concept of technology and its ethics in the past nursing and caring literature. The study questions are as follows: What is the concept of technology in nursing and caring literature? What is the meaning of ethics in the context of technology in nursing and caring literature? The aim is to find evidence on technology as a concept and its ethics in caring and nursing sciences in the light of past studies. The evidence is needed to summarize and evaluate the current knowledge of the concept and its ethical value from the viewpoint of caring and nursing science and to develop the theory in caring science.

Background

This study is part of a caring science research project at Åbo Akademi University aiming to increase knowledge and evidence of the concept of technology and its ethics *in caring science*. The basis for caring science in this study is determined by referring to caring as something human and natural in nature. Caring is regarded as love and charity demonstrated in natural caring, in search of goodness, beauty, and the eternal. The core of caring is ethos, the particular task of caring, in which values and ethics come true as ethical actions in a caring relationship. The core of ethos is ethics. The human being is seen to be fundamentally holy, an entity of body, soul, and spirit. The human dignity is absolute, and it means that every human being has a right to be respected and treated as a unique, autonomous wholeness.[20,21] Technology of care is a sub-area of caring science.[22] Thus, the same basic assumptions and philosophy of caring science apply to it.

In this study, the focus is on the concept of technology and its ethics. Moreover, technology refers to caring, patient care, and something patients or their significant others use. Based on this limitation, the study excludes the special technology used only by educated healthcare personnel; technology used for other than caring purposes, for example, documentation and quality systems;[23,24] technology for perinatal care, such as electronic fetal monitoring systems[25] and deep brain stimulation systems in the management of disorders of consciousness;[26] technology for diagnostics[27] and surgical purposes;[28] genomic technologies;[29] robots and devices used in operating theatres; or technology for intensive care helping patients to recover from life-threatening conditions.[30] Similarly, technologies for professional education of healthcare personnel, such as simulation,[31–33] are excluded unless they are used in patient care.

The review

Purpose, study questions, and aim

The purpose of this study is to describe and summarize the concept of technology and its ethics in the past nursing and caring literature. The study questions are as follows: (1) What is the concept of technology in nursing and caring literature? (2) What do ethics mean in the context of technology in nursing and caring literature? The aim is to find evidence from past studies to answer the research questions.

Design

Whittemore and Knafl[34] have updated the literature review methodology by summarizing not only the past quantitative but also qualitative, theoretical, and conceptual research. By summarizing and drawing valid conclusions from the past research, the purpose is to gain a profound understanding of the concept and the phenomenon.[35] In this study, the conceptualization process has been carried out throughout the article, not restricting it to the "Results" or "Conclusion" section.[36] The methodology of this integrative literature review is to integrate quantitative, qualitative, and explorative studies, literature reviews as well as theoretical and conceptual journal articles.

Material search methods

To distinguish technology and its ethics in caring and nursing, the material search was carried out with Medline[®] and CINAHL databases using the search terms technology, technolog*, nursing, nurs*, and caring and including related terms. As a search strategy, advance search was employed with the restriction of limiting the material from the year 2000 to February 2013 and limiting it to those journal articles published in English and evaluated as a five-star source by the database. In addition, a manual search was done during the study process from journals and reference lists.

Based on the focus of this study, articles describing the concept of technology and its ethics in caring science at general level were included. Similarly, technology used by patients or their significant others independently or together with a nurse and articles discussing the ethics of technology were accepted.

Material search outcome

Medline provided 503 journal articles, of which 465 were reviews and 39 articles were of empirical, theoretical, or conceptual studies. After applying the inclusion criteria to the titles and abstracts, 73 articles were selected for the first screening. They were carefully read through and their content was analyzed and evaluated from the viewpoint of the study questions. After completing this evaluation, 23 articles were included and analyzed.

The CINAHL search resulted in 282 journal articles, of which the duplicates with the Medline material search were removed. The articles comprised 32 reviews, and 250 were named as journal articles. After applying the inclusion criteria to the titles and abstracts, 36 articles were chosen for closer screening. Based on their thorough examination and content, eight articles met the criteria and were included in the material. A more detailed analysis of the articles revealed that the material consisted of many editorial, pictorial, or commentary journal articles not describing the data or methodology, thus resulting in their exclusion. The hand search from the reference lists and journals was done during the study process. Five articles were included with this method, increasing the total number of articles to 36.

Quality appraisal

Since the purpose of the study was to describe and summarize the concept of technology and its ethics in caring and nursing literature to acquire a broad knowledge of the subject, the number of included articles was reasonably high which in turn resulted in a variable quality of articles in relation to the description of the methodology of the article. A quality appraisal of individual research papers was made by classifying the articles into reviews and quantitative, qualitative, theoretical, and conceptual studies according to the description of the methods section. If this was not possible, the article was excluded from the study.

Data abstraction and synthesis

The material meeting the inclusion criteria was assessed and analyzed, and the answers to the study questions were collected inductively and tabulated (Table 1). The tabulation was done in a chronological order in the groups based on the research method. In the second phase of the analysis, the tabulated answers to both study questions were summarized and themed according to their content. The results were presented based on a summary of the whole material and as an answer to the study questions. The answers to the study questions were themed, based on their content, and the themes were italicized in the text leading to 16 themes on the concept of technology and 4 themes on ethics. In the "Discussion" section, the 16 themes of the concept and 4 themes of ethics have been synthesized into three categories.[34,35]

Results

General summarizing

The material of 36 articles comprised 16 literature reviews, 2 quantitative and 2 qualitative studies, 6 studies discussing device development experiments, and 10 theoretical or conceptual studies. It is noticeable how the approach to technology in caring varied greatly in these studies.

The influence of technology on caring and nursing has been identified and discussed widely since the beginning of this millennium and particularly over the past decade. During the data search process, it became evident that many of the journal articles on technology were written from the viewpoint of some other discipline including social sciences, medicine, information technology, and management.[6,42,44,45] In general, the studies adopted a positive standpoint regarding different technologies and their potential benefits to care. Only few of the articles criticized technology and its use. For example, the systematic literature review of the adaptive e-learning interventions with the purpose of improving dietary behavior presented a contrasting viewpoint concerning the effectiveness and cost-effectiveness of the use of e-learning technology.[46] Moreover, Smith[47] expressed concern about misunderstanding the information and the possible consequences of this when using the internet as an information tool. The possibilities of a false sense of security,[47] dependence on technology, the use of technology demanding more time and energy, and how

Table 1. Technology and its ethics in past research in chronological order (example of tabulation).

Author (year), country, journal	Design and purpose	Material and method	Results from the perspective of study questions	
			Study question 1	Study question 2
Reviews				
Lindberg et al. (2013),[37] Sweden, *International Journal of Telemedicine and Applications*	To review existing studies and to describe the use of ICT in home care for communication between patients, family, and healthcare professionals.	107 studies, one-fifth had (had) a qualitative approach, some of the studies used combined methods and most of the studies were quantitative.	Overview of studies describing the use of (the) ICT applications in home care. ICT = information and communication technology tools and services called eHealth. Including text messages, gathering and monitoring data, diagnosis and treatment at distances, and retrieving electronic health records. eHealth includes the interaction and communication between patient and health service providers. 13 different terms were used to define the technology in home care. (The) Terminology in order of (the) most frequent(ly) use(d): telehealth, telemedicine, technology and telecare, ICT/IT, telemonitoring, telenursing, eHealth, telehealthcare, telerehabilitation, e-rehabilitation, teleassistance. The most frequently used devices were video technology, text messages, and health monitoring. A combination or more than one device was used in several (31) studies.	No separate ethical reasoning. The benefits and drawbacks with the use of the ICT were described as part of the results. Response to the use of technology was predominantly positive. Communication improved, management of disease symptoms improved, possibilities to use the follow-up services at home became apparent. The accessibility to healthcare services improved and were cost saving, but the opposite results were also indicated.

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Table 1. (continued)

Author (year), country, journal	Design and purpose	Material and method	Results from the perspective of study questions	
			Study question 1	Study question 2
Nagel et al. (2013),[38] Canada, *Journal of Holistic Nursing*	To illuminate the dynamic evolving nature of nursing practice in relation to the use of telehealth and to highlight gaps in nursing knowledge in the virtual environment.	No description	Simple technology like stethoscope, advanced technology like intravenous pumps, cardiac monitors, and ventilators. Technology was used in the assessment of persons receiving nursing care, to assist in planning and communicating care plans, such as informatics and electronic charting. Telehealth modalities which were also called eHealth, informatics, and telemedicine. The devices of telemedicine, for example, telephone and telecommunicator, remote monitoring, and videoconferencing systems. Computer technology with possibilities to store and forward delivery models.	The aim of the article was to generate empirical evidence to support nurses in providing ethical, safe, effective, and holistic care. No other kind of ethical reasoning.
Caligtan and Dykes (2011),[15] USA, *Seminars in Oncology Nursing*	To provide an overview of electronic personal health information technology.	Peer-reviewed research studies, review articles, and web resources. 48 references.	Technology was named to be health information technology, technological solutions, electronic health records with consumer access, personal health records, and other relevant consumer tools for health, wellness, and cancer symptom management.	No separate ethical reasoning. Some discussion has been presented on human aspects of care when utilizing technology like the patients willingness to learn and use new technology in self-care, and the need to balance conflict between the art and science of nursing. Also concluded that more research is needed to evaluate the barriers between learning and using these technologies.

Table 1. (continued)

Author (year), country, journal	Design and purpose	Material and method	Results from the perspective of study questions	
			Study question 1	Study question 2
Quantitative studies Chou et al. (2013),[39] Taiwan, *CIN: Computers, Informatics, Nursing*	To explore the relationship between quality of life and technology acceptance of a telecare program.	105 valid questionnaires analyzed by SPSS	Telecare = applications of communication and information technology. Vital sign monitoring, safety monitoring, information and support services, information collection and analysis, and care management.	No ethical reasoning.
Jacob et al. (2013),[40] USA and Canada, *Journal of the American Association of Nurse Practitioners*	To examine symptoms, pain, characteristics (like intensity, location and quality), pain medication and non-pharmacological pain care, thoughts and feelings, and healthcare visits. Also the relationship between pain and sleep was examined.	Data were collected by electronic e-diary using a smartphone and were remotely monitored by an advanced practice registered nurse. 76 patients used the e-diary twice a day during nine months. The data were analyzed statistically and described by descriptive statistics.	Technology was an electronic e-diary and a smartphone.	No separate ethical reasoning. In discussion it was mentioned that in future, studies are needed to measure the possible benefits of the use of wireless technology and text message communication and online support in patients' care. The wireless intervention program model used in this study was seen to have potential to improve communication between children and adolescents and healthcare providers when the patients are suffering from chronic diseases.
Barnard (2000),[41] Australia, *Journal of Advanced Nursing*	To examine the ways of understanding technology in surgical nursing and implications for nursing and healthcare practice.	Qualitative, phenomenographic approach in order to identify and describe the experience of technology. Data were collected from 20 surgical nurses by using semi-structured interview and reflection of experiences and	Eight ways of understanding technology within the context of surgical nursing was defined: machinery and equipment, changes to skills, increasing knowledge, respect and autonomy, gaining control of clinical practice, clinical	No separate ethical reasoning. The article reflected how technology alters the free will of the people, how the use of technology demands more time and energy, how the user can be dependent on technology.

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567

Table 1. (continued)

Author (year), country, journal	Design and purpose	Material and method	Results from the perspective of study questions	
			Study question 1	Study question 2
		by creating a picture of the impact of technology during the interview. Analysis was done by seven analytical steps; described previously as familiarization, condensation, comparison, grouping, articulating, labeling, and contracting. Also, the comparison of text material and pictures was done.	resources of the practice environment must meet the needs of technology, the need to include the patients' experience and clinical presentation, and alteration to the free will of nurses.	
Device/tool development; experimental studies				
Chen et al. (2013),[42] Taiwan, *Journal of Medical Internet Research*	To evaluate the impact of a synchronous telehealth service on older patients with cardiovascular diseases. Quasi-experimental.	Data collection 6 months before and 6 months after the opening of the telehealth center assess clinical impact and cost-effectiveness.	Telehealth, health education, diet therapy, fluid status, drug adverse effect evaluation, drug compliance, mood or emotion care, support to use the advanced IT monitoring system.	No ethical reasoning. The benefits of using technology have been presented in conclusion: decrease on all admission rates, decrease on duration of all-cause hospital stays.
Theoretical and conceptual studies				
Booth (2012),[43] Canada, *Computers, Informatics, Nursing*	To organize the results of relevant studies examining the use of ICT in nursing practice into a systematic review and to examine the functionality and appropriateness of the DeLone and McLean IS Success Model as an organizing framework to evaluate health ICT used in nursing.	39 journal articles from the time period of 1995 to 2008 were reviewed from the perspective of what ICT is and the results of each study were summarized and mapped into the DeLone and McLean models on dimensions: system quality, information quality, service quality, user, user satisfaction, and net benefit.	The majority of the studies in the material were not theoretical in terms of conceptualization or instrument development. The technology is named ICT and described as computerized technology. Examples are named as electronic medical records (EMR), computerized provider order entry (CPOE) systems, point-of-care devices, and other internet related technologies.	No ethical reasoning. In the discussion section, it was mentioned that nursing literature has had limited discussion on ICT and client/patient. Also, the evaluation of ICT needs more theoretical underpinning.

The complete table is available from the corresponding author.

the use of technology can alter the free will of people were seen as disadvantages and possible harms to people.[41] Many journal articles had an ambivalent attitude to technology. On the one hand, technology was seen very positive, and on the other hand, it was a threat to human care and the humans themselves.[41,47–50]

One of the main questions dealt with the development of evidence-based practice by using computer technology.[37,46,50–52] In some researchers' view, acquiring knowledge and evidence to support patient-centered and safe caring in the context of technology was beneficial. This was supported by some frame-works and models of other disciplines.[12,38–40,43–45,52–56] The common question and focus of research has been technology itself: what it is, who uses it, and for what purposes it is used.[6,15,36,56,57] Other research interests included nurses' technical skills and competences, how technology influences the nurse–patient interaction, and how technology changes nursing.[37,38,47,48,50] In this material, surprisingly few studies showed interest in users', that is, nurses, patients, or their family members, opinions and experiences of using technology.[42,52,58,59,60]

Technology as a concept

Technology is described as being information and communication technology (ICT) and its applications,[37] discussing web-based self-management exercise and intervention programs,[53] applying telehealth services and interventions such as smartphone applications to sharing health and disease information, assisting in monitoring patient's condition and symptoms as well as increasing communication between outpatients and nurses with text messages and phone calls.[38,42,58] E-learning devices and e-diary in health promotion, health behavior change support, and symptoms monitoring were also included in ICT.[12,15,29,39,40,42,44,46,53–55,57–64] In the literature review of Lindberg et al.,[37] researchers reviewed 107 studies describing the use of ICT in home care. The results showed that 13 different concepts were used of ICT in the home care context. The concepts comprised telehealth, telemedicine, technology, telecare, ICT/IT, telemonitoring, telenursing, eHealth, telehealthcare, telerehabilitation, e-rehabilitation, teleassistance, and mobile phones. Fjeldsoe et al.,[62] Jacob et al.,[40] and Haze and Lynaugh[58] also used the concepts such as picture phone and smartphone services and short message services (SMS) when describing ICT. Repique's[54] study discussed the value of ICT and its significance to psychiatric nursing and presented the concept of "psychotechnology." Further-more, Kidd et al.[57] introduced the concept of "e-hospice" in the context of seriously ill patients' home care. Suominen et al.[65] have applied natural language technology (NLT) to nursing purposes. This technology also utilizes ICT.

The concepts of *high-tech*,[66,67] *advanced technology*,[38] and *medical technology*[48,52] share the same con-tent. These concepts were used when devices and mechanical machines, including cardiac electronic moni-tors, pumps and monitors of enteral and parenteral nutrition, external and internal cardioverter, hemodialysis, respirators, distinct hydration, medication, and nutrition therapy devices, were complicated. Technology of cancer nursing[12,50] and pediatric nursing[52] used the same applications as the ones in high-tech, advanced, or medical technology. Nagel et al.[38] presented the concept of *simple technology* referring to instruments such as stethoscopes. Simple catheters, occlusive devices, and collection devices could fall into this category.[56] The concept of *assistive devices*[47] contained feeding, bathing and clothing devices, medicine dispensers, footwear, intelligent ambulatory walkers, medication remainders, safety alarms and nurse call buttons, as well as robotic services.

In the concept analysis of technology in nursing, Aquino et al.[68] defined technology two-dimensionally as *products and processes*. In Barnard's[41] study, the concept of technology is viewed as equipment, *machin-ery and services.* Alexander and Stagger[48] defined technology three-dimensionally comprising *monitoring and graphical interface, telemedicine and telenursing, and medical devices*. Marden[45] approached the con-cept from health-related quality of life and technology dependence perspectives and divided the concept into three dimensions: *prosthetic, curative, and the one that regulates natural processes*. The starting point

for the study of Marden[45] was Sandelowski's[69] definition relating technology to existing and novel drugs, equipment, devices, techniques, and procedures used in care. Alexander and Kroposki[6] described the concept of technology in terms of "the nursing caring processes used to change the status of an individual from a patient to a person no longer requiring nursing care."

Ethics of technology

The articles discussing the development of technical equipment, for example, the Internet interventions, web-based self-management programs, or medical technology, did not usually include a section on ethical reflection.[39,43–45,52,61] The benefits of the developed or studied technology were mostly discussed in the "Results" or "Discussion" section.[28,37,53] *The human good was seen to be the benefit* that a patient or nurse or society gains by using technology. In this material, the benefits provided were multiple. It was suggested that by using ICT, the communication between patients and healthcare professionals got better and managing disease symptoms improved. Similarly, the utilization of follow-up services at home improved patients' self-management on their illness, symptoms, and treatment. Moreover, it was easier to pose new or even sensitive questions to healthcare personnel sending e-mail. The response was also quicker compared to more traditional methods. The use of different teleservices enhanced patients' adherence to treatment and empowered them. Patient satisfaction improved because of the real time service and easier access to healthcare.[37,54,57,62] It was also reported that the use of ICT improved healthcare in rural areas as the need to transport patients decreased. Technology was regarded as an alternative and better method to provide patient education and health services to a wide range of population. Technology improved the access to health services and was considered a cost-effective and cost-saving method for providing services.[55,57]

However, the use of *ICT was seen to threaten the human good* if the human aspects, such as willingness and the ability to use technology or the conflict between technology, nursing art, and nursing science, were not considered.[15,37] According to the systematic literature review on randomized controlled trials, Harris et al.[46] claimed that there is not yet enough evidence on the effectiveness or cost-effectiveness of using electronic devices in health promotion or patient education. Smith[47] expressed his concern about the possibility of misunderstanding the information received from the Internet or other electronic sources. The possible consequences of the misunderstanding might be harmful or even catastrophic for the patients. Furthermore, it was suggested that technology can alter the will of people, and the user can become dependent on technology.[41] Misplaced trust of technology, inflexible systems, poor navigation systems, and leaving the users' needs without attention create problems. This kind of technology demands more time and energy than traditional methods. From the ethical perspective, these problems threatened user satisfaction, safety, and dignity.[48,57] The global apprehension about the effects of technology on human rights and equality has been expressed. The increased polarization between the rich and the poor is partly seen as a result of the use of technology. This problem has been mentioned as a barrier to social justice and common good.[49]

The use of technology in care had many obvious and potential benefits as well as many risks from the aspect of human good. Many problems and challenges were described, and it was suggested that the human good, that is, dignity, autonomy, and other dimensions of the good human care, cannot be attained if these problems and challenges are not solved. The focus of many researchers was to produce evidence to support nurses in providing ethical, safe, effective, and holistic care.[15,38,47–49,57,60,63,65,66] *The problems or challenges in healthcare that should be solved* to provide ethical care consisted of several items. First, better communication pathways, training and technical support systems, and workable protocols should be created. Second, new skills and management should be taught and put into operation. Finally, patients' privacy,

autonomy, informed consent, equality on access to health services, and confidentiality in the services should be secured. Patients' rights to their own health records and their use should be ensured. Part of ethical and safe care is the nurse–patient relationship and the need for human touch which should also be considered and tailored according to the patients' needs. Yet another challenge to be taken up is the medicalization of the home environment.[47,57]

The researchers' models and proposals to gain more ethical care when utilizing technology were many. According to Fjeldsoe et al.,[62] tailored technological services are more engaging and effective than untailored automatic services. The role of nursing has changed, and it should assume the role of an interpreter between technology and the patient. Technology challenges the caring relationship between patients and nurses; the content and methods partly change and that is why measures for developing knowledge, evidence, and education are needed. From the ethical aspect, the most important perspectives on preparing for the technological change are focused on caring, health, health experience, well-being, and the uniqueness and autonomy of human beings.[15,38,50] Chambers and Connor[60] proposed guidelines to protect the legal, ethical, and inalienable human rights of technology users. The guidelines included respecting human dignity, worth and fundamental rights, autonomy, privacy, confidentially, informed consent, nonmaleficence, justice, and beneficence. Dunn and Board[52] argued that balance between patient-centered care and skillful technological procedures was the key to providing authentic and nurturing care. Also, Wolpin and Stewart[12] highlighted the importance of a patient-centered approach to technology. The dimensions of patient-centered technology were usability and acceptability. An et al.[44] created a model of Information and Communication Technology Acceptance in a multidisciplinary research team. The model provided variables evaluating the consumer orientation including perceived ease of use and usefulness as well as behavioral intention behind use, subjective norm, image, output quality, result demonstrability, compatibility, perceived playfulness, website usage, and website loyalty. Alexander and Kroposki[6] evaluated technology in care from administrative viewpoints including instability, variability, and uncertainty.

Discussion

Limitation and strength of the evidence

This integrative literature review comprised journal articles available in refereed journals, and the aim was to find evidence on how technology as a concept and its ethics are discussed in caring and nursing journals. The purpose of the study was to describe and summarize technologies and their ethics in nursing literature. To acquire profound knowledge of the concept, an extensive search was carried out. The number of included articles was fairly high and the quality of articles variable to create a comprehensive and integrative description of the use of the concept and its ethics. When evaluating the limitations of a literature review, it is vital to explore the whole study process including how precise and extensive the literature searching strategy was and how the selection bias of the material was prevented.[35]

To map out the effective literature search strategy, the search was performed with the support from information specialists focused on health sciences and systematic reviews. Based on discussions with two independent information specialists, the electronic databases Medline and CINAHL were selected. Both experts considered these two databases to cover a wide range of material proving the use of other databases futile. However, the chosen databases and keywords may have resulted in missing some relevant literature. Since the concepts referring to technology are multiple, some relevant studies may have been excluded. Furthermore, the area of technology is developing, rapidly resulting in the use of technology not yet been documented and studied. Similarly, technology used by healthcare professionals today could be technology used by patients in future. Nonetheless, content saturation was reached from the perspective of the study questions.
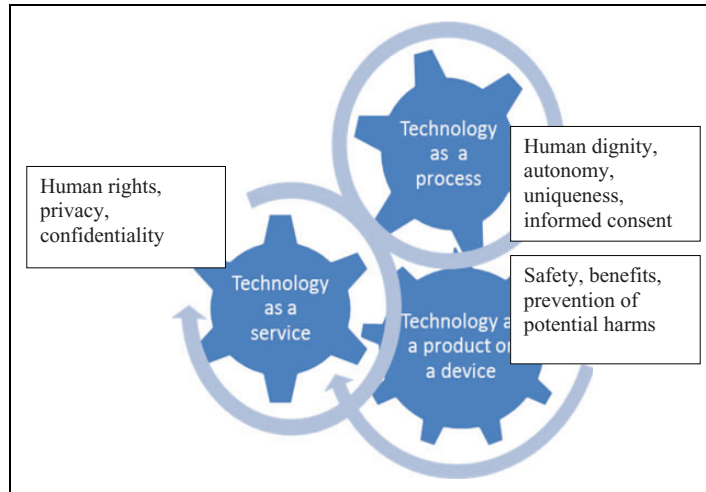
Figure 1. Dimensions of the concept of technology and its ethics in caring and nursing.

Other disciplines have relevant knowledge of the phenomenon, but the focus of interest in this study was limited to studies of nursing and caring science.

During the entire study process, the guidelines of responsible conduct of research have been followed. In particular, the authors' rights concerning the study material have been taken into account by careful reference marking.[35,70]

The main findings

According to the results, the concept of technology in caring and nursing literature refers to modern information and communication technology, high-tech and advanced device technology, simple tool technology, and assistive technology. Ethics in the context of technology in caring and nursing literature is not self-evident. Some of the journal articles did not provide any ethical reflection. In their section on ethics, several articles described technology as a benefit because it improved communication and the management of disease symptoms with technical devices or products, or as possibilities to use the follow-up services at home at any time with the process possibilities that technology offers or as improved access to healthcare services and reduced costs. Some of the articles presented potential harms which would cause ethical problems when using technology in care, for example, solving the potential harms technology causes when it is not available for everyone and everywhere and when the user's ability to use technology is limited; similarly, how to guarantee the dignity, uniqueness, and autonomy of patients and how to deal with issues related to patients' privacy, confidentiality, and informed consent. The developed theories and models approached the issue from the viewpoint of safety or clients and did not attempt to solve the presented ethical challenges in care (Figure 1).

From the perspective of caring science, this outlines technology as products and devices used in care, whereas technology as a process refers to all methods helping people in caring relationships and promoting good in health, sickness, and suffering. Technology as a process is essentially interactive. Nurses act as interpreters between patients and technology. Finally, technology as a service means producing care by using technology and its applications in the act of caring. When the act of caring comes true in the ethical and caring way, the human dignity and human rights as well as the human good of the patient's realized and the potential harms will be prevented (Figure 1).

Conclusion

The concept of technology has been discussed in nursing and caring literature to some extent, whereas very few studies on the ethics of technology exist. There has been demand for an integrative literature review to gain a comprehensive understanding of the use of the concept and its ethics as well as to provide a basis for a new perspective on them in caring science.[35] The terminology is related to devices, services, and processes. Many of the concepts describe the context or purpose of the use or meaning of technology. The meaning of the technology in this context is seen as a lifesaving device like a hemodialysis device. The ethical aspect of technology is mainly seen as benefits, risks, or unsolved problems. The concept and its ethical connection with the foundation of caring science are not known.

The findings indicate that the concept of technology in caring and nursing sciences is multifaceted. Much has been written about technology, and the discussion on the topic has been animated. The use of technology constantly increases, and everyone involved in the process agrees it will solve many healthcare issues in the future. At the same time, critics in caring science try to draw attention to the risks and threats of technology in care. Some evidence and theoretical models have been presented to promote safe and ethical care when using technology, but still more research knowledge, practical methods, and processes as well as legislation and resources are needed to integrate technology and its ethics with care.

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