Technology concept in the view of Iranian nurses

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ABSTRACT

Background: Over the years, the concept technology has modified, especially from the viewpoint of the development of scientific knowledge as well as the philosophical and artistic aspects. However, the concept of technology in nursing are still poorly understood. Only small qualitative studies, especially in Iran, have investigated this phenomenon and they just are about information technology. The aim of this study is to gain a better understanding of the concept of technology in the view of Iranian nurses.

Materials and Methods: This study was qualitative explorative study which was done with a purposeful sampling of 23 nurses (staffs, supervisors and chief nurse managers) working in Isfahan hospitals. Unstructured interviews were including 13 individual interviews and 2 focused-group interviews. In addition to this, filed notes and memos were used in data collection. After this data transcribing was done and then conventional content analysis was used for data coding and classification.

Results: The results showed that there are various definitions for technology among nurses. In the view of nurses, technology means using new equipment, computers, information technology, etc). Data analysis revealed that nurses understand technology up to three main concepts: Change, Equipment and Knowledge.

Conclusions: In deep overview on categories, we found that the most important concept about technology in nursing perspective is equipment. Therefore, it is necessary to develop deep understanding about the possible concepts technology among nurses. We suppose that technology concepts must be defined separately in all disciplines.

Key words: Concept, content analysis, Iran, nursing, qualitative research, technology

INTRODUCTION

Like other systems in the society, the health system is growing very fast and technology appliance is getting inevitable more and more. This led to more concentration to healthcare technology in the beginning of the recent century.

Nursing practice has been, and will continue to be, altered considerably by using informatics and health care technology. Technology ranges from simple using of a digital thermometer to complex leading edge intensive care unit, hemodynamic monitors and fully computerized clinical management information systems. Informatics and health care technology have revolutionized the delivery of health care and created a level of complexity never experienced previously by health care providers.[1]

Introduction of technology into the health care means that there is not a specialist nurse who does not use daily at least one form of health care technology in her/his profession. So it is important for nurses to improve their knowledge and skills about technology, which has the deep effects on technology application and its capabilities. Therefore, study about technology knowledge is essential in nursing profession.

The more use of technology in health care means that nurses and other health care providers need more information about technology, and it is believed that better technology understanding will promote its using in patient care and as well as the quality, safety and costs of care.

Aquino and others[2] conducted a research in 2010 about analysis of the technology concept in nursing based on the evolutionary method in 2010. They reinforced the need to do more research using theories and conceptual analysis, besides studies for summarizing the existing productions on the theme: Conceptual analysis of technology.

Along with technology allied issues, technology

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conceptualization is an on-going debate among technological theorists, who ask questions such as 'Is technology more than just hardware?'[3] Seemingly, there is less agreement on the definitions and measurements of technology.[4]

Since just empowered nurses about technologies have to intervene in designing, selecting and using technology in the health care environment, technology conceptualization is essential for nursing. Whereas technology concept is an inseparable part of technology knowledge, discovering the technology concept in the view of nurses is important issue for developing the technology knowledge in nursing.

Although there are many researches about technology achievement and its using, but we believe that these researches are insufficient for two reasons; first they are often carried out in the developed countries like USA, UK, Japan and Germany. And that few researches, especially in nursing, have been done in the developing countries such as Iran. In other words, the researchers had paid little attention to the technology concept. However, we argue that there are concepts related to technology that may have been explored in other fields like science, education and research, but not in nursing and not in Iran. Consequently, conducting a research about "What is the technology concept in the view of nurses?" seems essential and this research report focuses on it.

MATERIALS AND METHODS

Conducting individual qualitative studies has become increasingly common in recent years. Although this is still an emerging research discipline, such an approach is one means for promoting the patient-centeredness in health technology assessments.[5] Since there was no theory and research in this field, an explorative qualitative approach by using content analysis method was chosen and classification codes were extracted from raw data. Research environment in this study consisted of all the places for example, hospital, university and home, where we had access to experienced and key informant nurses.

Three men and 20 women who were 15 nurses, 3 head nurses, 2 educational supervisors and 3 chief nurse managers participated in this study included 21 under graduate and two graduated nurses. The participants' clinical experience ranged from 2 to 28 years.

Data collection was done through interview. We used systematic and purposeful sampling to discover the nature of what technology means for the nurses. Also heterogeneous sampling was used for collecting different views about the technology concept.

Individual and focused-group unstructured interviews were conducted to discuss the perceptions of nurses about technology. First, unstructured interview was started by a general question: "*What means technology for you?*" The semi- structured interviews were subsequently conducted based on the first interview. The interviews continued with such questions as: "*What is your intuition about technology?*" "*What comes to your mind when I say technology*"? "*Take an example please*". Some critical questions asked like: *How*? *Why*? And "*please tell me more*".

To facilitate discussion, the interviewer used open-ended questions based on the experiences about the concepts of technology concepts, presented before by the nurses, if such elements had not been spontaneously mentioned by them.

During the interview, we considered providing feedback, making trust, and avoiding inducing comments to the interviewee. Interviews were done at calm and private places without disrupting the nursing care, and for respecting the ethical considerations; the participants' informed consent was received before the interview.

The informal observation and taking notes took place during the interviews. Duration of the interviews was about 30-75 minutes according to the participant's preference and information. Two focused- group interviews in four and seven person groups were conducted using brainstorming and group interview techniques.

The interviews were recorded by ICD-recorder and then transcribed word by word and qualitative thematic content analysis was conducted. The transcriptions were analyzed step by step following the rules of qualitative content analysis method.[6]

Step 1: Data preparation: The audio files were transcribed by using lyric maker capability in the jet audio software to reflect thoughts and behaviours of the participants. Then the texts transported into word processor for commenting and highlighting the important parts

Step 2: Defining the unit of analysis: In this stage, we determined sentence, word, phrase or paragraph as coding unit by reviewing the interview's text

Step 3: Developing categories and a coding scheme: The deductive coding was done. The concepts were put into similar categories and then the main categories formed

Step 4: Testing coding scheme on a sample of text: Coding part of the texts was conducted individually by researchers. Then coding consistency was checked through an assessment of the inter-coder agreement during the meetings. Revising of the

Table 1: Part of the coding scheme

Participant's comment	Meaning unit	Conceptual code	Subcategory	Category	Main category
P2C1	[technology is]…new radio-graph devices or other facilities like that …new cardiac monitors with new capabilities… theses are technology….	Technology is new devices and equipment	New device	Novelty	Change
P23C1	Every new thing which is used in nursing [is technology]… For example, new surgery techniques….	Technology is new technique	New technique	Novelty	
P15C45	New drugs which are used [is technology]…	Technology is new drug	New drug	Novelty	

coding rules continued until sufficient coding consistency was achieved. Table 1 shows at the coding example

Step 5: Coding of the whole text: The interview's text was read carefully, and the pertaining codes were recorded. Then all of them were transferred into OneNote software, the conceptual codes were cleared, the concepts categories were classified and finally re-encoding was done. Every overlapped or unusual code was deleted

Step 6: Assessing the coding consistency: In several stages, the researchers verified and investigated the encoding process. When there was no agreement between the researchers, re-encoding was performed until coding consistency was achieved. In addition, the codes were reviewed by four PhD students and confirmed. The researchers tried to use purposeful sampling and choosing participants with various experiences for increasing the possibility of shedding light on the research questions from a variety of aspects for providing.

However, the researchers do not clearly insist on the findings' transferability. Hence the procedures are explained clearly and obviously to help following up of the research process so that other researchers can judge the appropriateness of the research process. Recording and transcription of the participant's interviews, as well as coding and classifying of the concepts by some expert nurses and academic members of Nursing Faculty who did not participate in the early stage of the research and were familiar to qualitative research, were other critical strategies for achieving credibility during the research process.

Step 7: Drawing conclusions from the coded data: Reading and re-reading of data discovered characteristics and dimensions of the categories and the relationship between them. The results of this stage are provided in the Results section.

RESULTS

Table 2 shows the participants' characteristics. The average age of nurses was 38 years. 10 respondents were MS

Table 2: Participants' demographic characteristics

Characteristics	N
Participants' age (years)	
25-35	8
35-45	10
45-55	2
Sex	
Male	3
Female	20
Job position	
Nurse	15
Head nurse	3
Supervisor	2
Chief nurse manager	3
Education	
Bachelor	13
Master of nursing	2
M.Sc. student	8
Work duration (year)	
Level	2-28
Mean	13.5

students in the Nursing Faculty of Isfahan University of Medical Sciences who were employed in different hospitals.

Many of the nurses mentioned that technology is more than one concept, but none of them shared the equal concept and perception of the technology. We tried to encourage the nurses to clarify their conceptions more and more by some related questions.

We reached to about 150 interpretive meanings after analyzing the data, which after combination produced 25 common interpretive meanings. These meanings were classified into 15 codes as the following seven categories and three main categories:

Knowledge is a main category that consists of three subcategories: Up-to-date science; access to technique and information technology. Up-to-date science subcategory includes two conceptual cods: New science and scientific

working. In addition, technique subcategory includes conceptual codes related to access to technique and theory. Similarly, the main of equipment category includes conceptual codes related to care facilitator equipment, electronic equipment and computers. In addition, the main category of change includes three subcategories: Having novelty, promoting and creativity. Novelty subcategory includes three conceptual codes: New device, new technique and new drug.

Creativity also includes innovation and creativity conceptual codes.

Technology means knowledge in the view of Iranian nurses

Analyzing the obtained data showed that some participants regarded technology as knowledge. Nurses defined technology such that which we come to conclusion they took technology as equal knowledge. Some nurses took technology as *"up- to- date science"* and *"knowledge"*. For example, a young ICU nurse specialist stated:

"…hum, I could tell about technology; it is like using up- to- date science in medical area, this [is] everything, that is up- to- date and scientific now…"

On the other hand, some participants considered the technology concept as *"working based on scientific principles"* and *"access to new techniques".* For instance, one head nurse replied us when we asked her about what kind of technology they use in the care unit:

"…We use technology…hum…, oh always this is the same nursing cares, which we do based on the scientific principles…"

And other nurse said:

"… I think technology is like that effort we make for empowering our information … access to…techniques, theories, there is no differences, all of them help together…"

Some nurses also defined technology as *"gathering computer information"* and *"information technology"* and *"gathering or changing data via the internet and computer".* For example a nurse said:

"Hum…, Technology means information, computerized system, transporting data via computers, For instance, I could gather data from computer instead of going to the ward for checking out how many patients or free beds are in the ward and everything will be easy for me."

According to the above sentences, we can mention that the nurses know "technology" as equal as "knowledge", which helps them to perform their duties in a different and better way.

Technology means equipment in the view of Iranian nurses

Technology was viewed as equipment in the nurses' view. The nurses often defined technology by the statements, which we categorized them in the "Equipment" main category section.

Some nurses defined technology as *"electronically equipment and devices"* and when we asked them about some examples of the technology, they always cited devices and software. We have some supervisors' statements below about technology as well:

"Technology…[means] using electronic equipment in practice and patient treatment for better documenting …"

And some other nurses defined technology as *"new equipment"* that helps the nurses for doing better and more comfort duties. For example:
It [technology] should not only be a robot that fulfils specific duties, rather it can be an adhesive tape and smallest new devices that make nursing very easier.

Many nurses referred to *"computer"* when explaining about technology.

An emergency nurse:

"…Imagine, when a software comes to the market, it is brought into the medical field, or …new photograph devices or things like this, new capability in new monitors, this is technology…in my opinion, technology is both software and hardware…"

Technology means change in the view of Iranian nurses

On the other hand, sometimes the nurses defined technology as *"improvement", "novelty"* and *"innovation".* They believed that technology is anything that helps nursing development and expansion; therefore, we named labelled other main technology concepts as change.

The nurses sometimes took technology concept as new agents for improvement of system facilities and promoting the affairs. Even in some case, a new drug means technology for them. A chief nurse manager spoke about technology:

"…Technology in my mind is using facilities for improving a system. Now these facilities may be in subsystem, in or out of system. Use of all facilities or conditions existing in every system plan for improving system."
Some other nurses knew technology as *"novelty"* and *"creativity".* They considered technology as every new thing that is used for making nursing more easily.

One head nurse said:

"…In my opinion, when somebody tells about

technology, first, new things stamp in the mind, new facilities, which come in a system and the system members accept it…"

Sometimes, nurses took technology as equal to "*innovation*". For example, a head nurse replied our question "when we are talking about technology, what comes to your mind" as:

"…Always [technology means for me] as creativity and foundation of anything that has been established based on scientific principles. I think this means technology…"

Therefore, technology concept in Iranian nurses' view formed three main categories. Figure 1 shows these categories and the corresponding sub-categories.

Discussion

Technology is a multifaceted phenomenon that extensively influences nursing history, contemporary nursing practice and its future. Nurses are expected to practice in clinical environments where technical performance is respected highly by both the society and the health care professions, more than ever before.[7] We believe that improving knowledge about technology in nursing is important. So this research attempted to understand the concept of technology concept among the Iranian nurses.

The present study suggested three main concepts about technology in the nurses' viewpoints. Few studies have been done before, which defined nursing technology and this study confirmed some of their results but some new and unique concepts were obtained as well.

The nurses in this study defined technology as knowledge. and Johnson[8] confirms this finding too. He believes that technology is a form of knowledge which usually held notion in science and technology studies. He cites technology as a kind of knowledge. Taking technology as knowledge places effectively technology into social and logical history as well as into philosophy.

Also Morrison,[9] in her research on technology as a change agent in the classroom, examined how a technological innovation affected changes in the instruction and the classroom environment, and subsequently, resulted in improving students achievement and performance. The evidence from this three-year study suggested that a technological innovation can serve as a change agent. So technology can be conceptualized as change in nursing too.

Furthermore, Barnard and Gerber[7] undertaken a phenomenon-graphical research to identify different ways that technology is understood and experienced by
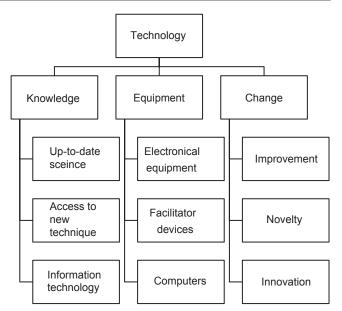

Figure 1: Technology concept's categories and subcategories

surgical nurses in 2002. The data analysis from 20 surgical nurses gave eight concepts about technology. Technology experienced as respect and autonomy, control of clinical practice, clinical resources, the need to include the patients' experience, machinery and equipment, changes of skills, increasing knowledge and alteration to the free will of nurses. We found some similar results in this study and our data showed that technology concepts (knowledge, equipment and change) may be shared among all nurses everywhere.

Additionally, the socio-technical theory introduces a broad concept of technology that enables us to understand the relation between technological and social changes. Accordingly technology embraces a combination of four constituents: Technique (meaning the technological object in question), knowledge, organization and product.[10]

In summary, this study showed how nurses conceptualize technology. We believe technology concept as knowledge can help nursing managers and planners to develop particular strategies for implicating technology.[11] Also understanding technology as a care facilitator and promoter, in the nurses' mind, makes its acceptance and use easier. In addition, every new agent can understand facilitator or, in the opposite, trouble; therefore, nurses may be resist against technology and refuse applying it when they imagine it as change agent.

Conclusion

In deep overview on the emerged categories, we found that the most important concept about technology in nursing

perspective is equipment. Although full understanding about technology concept can help nurses about implicating and adapting to it, but they haven't comprehensive understanding about technology concept. So the study revealed that it is necessary to promote using technology for prevention, diagnosis, and treatment in health care systems through developing technology concepts among nurses instead of unconscious and empirical using.

Limitations

The limitations of this study are related to its design. In qualitative studies, quality would be affected by individual researchers' skills, personal biases and idiosyncrasies[12] and this may be affected our study too. However, all researchers had experiences in qualitative study. Thus, there is the need for further qualitative and quantitative investigations on the factors that would influence perceived technology concept among nurses.

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