

Attitude of Pediatric and Adult Critical Care Nurses about Technology Uses in Nursing Care and Caring Attributes

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Abstract:

Background: The health technology has greatly influenced the health care system and the interaction between nurses and patients. Caring and caring attribute is the core of nursing profession; therefore, it is necessary to explore how nursing care is affected by technology. The aim of the study was to explore the attitude of pediatric and adult critical care nurses about technology uses in nursing care and caring attributes. **Design:** A descriptive exploratory research design was conducted for fulfilling the aim of this study. The study sample included a convenience sample of 215 nurses working at Mansoura University Children's hospital, Mansoura university hospital, Emergency hospital and oncology center affiliated to Mansoura university, Egypt. Two tools were used for data collection: The first tool was the Influence of Technology on nursing care Questionnaire (ITQ) and the second tool was Caring Attribute Questionnaire (CAQ). In addition to demographic characteristics of studied nurses. **Results:** the results of the current study showed there were a statistical significant difference between pediatric and adult nurses in all items of the scale. Approximately two thirds of pediatric nurses (60.5% & 63.2% respectively) responded with agree that the technology uses in nursing care requires highly technical skills and the mastery of technology helped the nurses to take control of their work environment compared to 84.2% & of adult nurses responded with uncertain and disagree in this point. **Conclusion:** Pediatric and adult critical care nurses have positive attitude regarding technology uses in nursing care. Some negative attitudes concerning technology reported by nurses due to of lack of knowledge about technology uses and the relationship between technology and patient safety. **Recommendation:** Educational and training program are recommended to improve the overall nurses' attitudes about technology uses and advanced caring attributes in nursing care.

Keywords: *Caring Attributes, Nursing Care, Pediatric and Adult Critical Care Nurses & Technology Uses*

Introduction

Recent progress of technological advances in the health care system has added to the advance of diagnosis, management and caring in hospitals. The world is being formed by technology and the effects of technological growth on patient-nurse interaction are progressively rising. Numerous technology interpreters have stated that the nursing profession has affected by the invasion of technology. Technological improvement has documented as an opportunity for nurses to get closer to critically ill patients. Technology uses increases the excellence of patient care, simplify many practices that are time overwhelming for nurses and facilitates problems solving (Bagherian, et al., 2017 & Ozan & Duman, 2020).

Technology incorporates the best practices into patient care and ropes evidence-based practice. Therefore, it has affirmative outcomes on healthcare and nursing practice such as keeping patient's safety,

improving healthcare excellence, and dipping healthcare expenses. Technology facilitates replacement of information between patients and nurses, and improves their connection. It helps patients, nurses, and other healthcare team to create suitable choices and accomplish positive outcomes. In addition, the electronic records support clinician judgments by recording and recovering patient data (Pamplin, et al., 2020, & Jouparinejad et al., 2020). Technology supports the autonomy of patients potentially in require of care so they are able to continue alive autonomously with least or no nursing support. Technology improves emotional and physical health for health professionals. Technological systems have the possibility to increase nurses' efficiency by decreasing the time that they spend carrying out documentation (Moore, et al., 2020). Technology substitute features of individualized nursing care and contributes to diminish the increase in costs of care and deficiencies

of expert critical care nurses. In addition, technology supports health association by improving transfer processes or collaboration between different organizations (Huter, et al., 2020).

There is a strong relationship between nursing and technology influencing the caring principles and performance of modern nursing. It was assumed that technology could advance the quality of nursing care. As a result, technology decreased nurses' workload, permitting nurses more time with their patients to decrease anxiety and concentrate on patients' needs and problems. Recently, it has affirmed that despite the advantages of technology, still technology never substitute the compassionate care provided by nurses. Technology can operate as a physical obstacle between the nurse and patient, therefore having upsetting outcome on communication and depersonalized liberation of care. In addition, technological devices attract nurses' attention and can separate a nurse from a patient (Bagherian, et al., 2017).

Technology, caring, and competency are significant features of caring practice in pediatric and adult critical care nursing, which differs from caring performance in other medical areas. Caring practice in adult and pediatric intensive care units (ICUs) is vital and multifaceted due to the various technologies used to care for patients with severe conditions. Nurses frequently utilize their time to deal with problems of complex technologies, and this increases nurses' feelings of stress. As a result, nurses should sustain excellent technological competency and offer the greatest caring practice for their patients (Li and Kongsuwan, 2021).

According to Locsin (2016), competent and expert nurses in technology will be able to identify their patients, moment-to-moment. Consequently, it is necessary to advance nursing technology to overcome the further compound problems in nursing practice. Nurses' role in technology is greater than just as users of complicated technology; they can advance the quality of patient care through innovative concepts. If nurses do not begin to recognize and contribute in the growth and implementation of technology, the nursing profession, and the patients' interest will suffer (Bahari, et al., 2021).

Significance of the study:

Critical care nurses in pediatric and adult intensive care units require keeping speed with the most recent information and skills to access data and manage e-records, latest management methods and technologies. Technology is involved in the majority of nursing care received for critically ill patient and there is a lack of understanding of how technology integrated into nurses' place of work (Adel et al.,

2014 & Brown et al., 2020). Therefore, it is important for critical care nurses to explore the attitude of pediatric and adult critical care nurses about technology uses in nursing care and caring attributes.

Aim of the Study:

The study aimed to explore the attitude of pediatric and adult critical care nurses about technology uses in nursing care and caring attributes

Research questions:

Are the nurses having positive attitude about the effect of technology uses in nursing care?

Subjects and Method:

Research design:

A descriptive exploratory research design was conducted for fulfilling the aim of this study.

Study setting:

This study was carried out at different pediatric and adult ICU in different hospitals affiliated to Mansoura University Hospital, Egypt as follow. Pediatric medical, cardiac and surgical ICU affiliated to Mansoura University Children's hospital and at Neurosurgery and anesthesia ICU affiliated to Mansoura university hospital, pediatric oncology ICU affiliated to oncology hospital and from Surgical Intensive Care Units (SICUs) affiliated to Emergency hospital. There are three SICUs; each one has 10 beds and provides care to patients with surgical, neurological problems, and multiple trauma injuries. All pediatric and adult critical care units are well equipped with the advanced technology required for patients' care.

Sample:

The study sample included a convenience sample of 215 nurses working in the previously mentioned settings regardless of their age, gender and educational level and willing to participate in the study.

Tools for Data Collection:

Two tools were used for data collection: The first tool was the Influence of Technology on nursing care Questionnaire (ITQ) and this tool was adopted from Sabzevari, et al., (2015). The second tool was Caring Attribute Questionnaire (CAQ) that adopted from Noh, et al, (2002). The tools translated to Arabic language to be suitable for all nurses with different educational background.

Tool 1: Influence of Technology on nursing care Questionnaire (ITQ), it included two parts as the following:

Part 1: Encompassed the demographic characteristics of the nurses such as age, gender, educational level, and department, place of work, years of experience and previous attendance of educational program about technology.

Part 2: Included 23 statements related to the effects of technology uses on nursing care provided for patient such as; technology makes the nurses feel not sure about their practice; technology makes treatment safer, reduces nurse's workload, requires high technical skills and does not interfere with the patient care. The nurses respond to the questions along 5-point likert scale from five = strongly agree while (1) means strongly disagree.

Tool 2: Caring Attribute Questionnaire (CAQ)

This tool adopted from **Noh, et al, (2002)**. The caring tool included 60 questions divided into four subscales as follow:

Theoretical Views (13 items) replicating agreement to the question 'what caring means to you as a nurse'. Practical Perceptions comprising Practical Perspectives: Caring (29 items) replying to 'I'm being caring when' and Practical Perspectives: Meaning (11 items), responding to 'how well does each item describe a caring nurse' and Pedagogical Sides (7 items) replicating 'how caring is educated and taught' caring on a five-point Likert scale. The responses were in the form of 5-point Likert scale, 1 =disagree; while 5 means strongly agree.

Validity and Reliability:

The tools revised from five experts of pediatric and critical care nursing departments from faculty of nursing, Mansoura University. They confirmed the content validity of the instruments of the English and translated Arabic version. The scale reliability done using Alpha Cronbach's coefficient test. The reliability was $\alpha = 0.824$ for tool I and $\alpha = 0.88$ for tool II.

Ethical Considerations:

Ethical agreement attained from the Research Ethics Committee at the Faculty of Nursing - Mansoura University / Egypt. Official permissions achieved from the managers of the hospitals included in the study. Nurses signed written permission for inclusion in the study after explaining the aim of the study; they were assured about the confidentiality of data guaranteed and they informed that they might leave the study whenever they need without any drawbacks.

Pilot study:

A pilot study conducted on 10% (20) of pediatric and adult critical care nurses to determine the possibility, applicability and simplicity of the tools and there is no modification done, so, those nurses were included in the study sample.

Method of data collection and Field of work

▪ An explanation about the aim and nature of the study were discussed with the head nurse and nursing staff in pediatric and adult ICUs in Mansoura University Children's hospital, Mansoura University hospital, Oncology hospital and Emergency hospital.

- The researchers tried to build trust relationship and keep relaxing atmosphere for nurses in order to gain their cooperation and interest.
- The researchers explained Influence of Technology on nursing care Questionnaire (ITQ) and Caring Attribute Questionnaire (CAQ), read some questions, clarified the ambiguity, and invited for any questions during the interview.
- Then the researchers collected the sheets and checked any unanswered questions.
- The data were collected using the previously mentioned two Questionnaires.
- The data collection documented through 6 months started from 1 February 2021 to the end of July 2021.

Statistical Analysis:

The researchers used "one-sample Kolmogorov-Smirnov test" to examine the data for normality. The Statistical Package for Social Science (SPSS), version 21.0 was used for data analysis. Frequency, percentage, mean and standard deviation were the descriptive measurements used in the study. Chi-Square used to test the significance of the study questions. The results considered significant at $p < 0.05$.

Results:**Table (1): Percentage Distribution of the Studied Pediatric and Adult Critical Care Nurses According To Their Demographic Characteristics (N=215)**

Demographic characteristics	Pediatric nurses N=(114)		Adult nurses N=(101)		Significance test
	No.	%	No.	%	
Age					
20 < 30ys	57	50	47	46.5	t =0.350 P =0.727
30 < 40ys	48	42.1	46	45.5	
≥ 40ys	9	7.9	8	7.9	
\bar{X} (SD)	30.43(6.38)		30.71(0.50)		
Gender					
Male	23	20.2	0	0	x²=22.81 p≤0.001
Female	91	79.8	101	100	
Qualification					
BSc nurses	61	53.5	81	80.2	x²=17.811 p≤0.001
Technical institute of nursing	34	29.8	15	14.9	
Secondary school of Technical Nursing	18	15.8	5	4.9	
Master	1	0.9	0	0	
Experience years					
< 5 years	52	45.6	47	46.5	x²=20.94 p≤0.001
5 < 10 years	14	12.3	34	33.7	
10 <15 years	23	20.2	6	5.9	
≥ 15 years	25	21.9	14	3.9	
Attendance of training program					
No	79	69.3	13	12.9	x²=69.65 p≤0.001
Yes	35	30.7	88	87.1	
Department /Unit					
Pediatric ICU	68	59.6	0	0	x²=215.00 p≤0.001
Neurosurgical ICU	0	0	34	33.7	
Pediatric Cardiac ICU	26	22.8	0	0	
Pediatric Surgical ICU	20	17.5	0	0	
Anaesthesia ICU	0	0	23	22.8	
Neurological medical ICU	0	0	25	24.8	
Multiple trauma ICU	0	0	19	18.8	

Table (2): Attitude of Pediatric and Adult Critical Care Nurses about Impact of Technology Uses in Professional Nursing Care

Items	Pediatric nurses N=(114)					Adult nurses N=(101)					Significance test	
	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree		
	%	%	%	%	%	%	%	%	%	%	χ^2	P
Using technology makes nurses not professionally sure about the practice	14	50.9	11.4	23.7	0	2	12.9	84.2	1	0	116	≤0.001
Use of technology in patient care often interferes with time & provision of care	8.8	57	7	27.2	0	2	97	0	1	0	47.52	≤0.001
I'm not sure technology is beneficial for my nursing practice	24.6	36.8	13.2	25.4	0	87.1	9.9	2	1	0	86.33	≤0.001
Increased use of technology in nursing care lowered the standard of the profession	26.3	33.3	11.4	28.1	0.9	4.0	9.9	85.1	1	0	119.8	≤0.001
Technology enhances patient care and recovery	5.3	14.9	4.4	68.4	7	1.0	84.2	0	14.9	0	104.2	≤0.001
Using technology in care requires highly technical skills	7	9.6	17.5	60.5	5.3	0	0	84.2	14.9	1.0	97.09	≤0.001
Mastery of technology helped the nurses to take control of work environment	10.5	6.1	17.5	63.2	2.6	2.0	84.2	2.0	11.9	0	133.5	≤0.001
Technology controls medical treatment	4.4	14.0	13.2	64.9	3.5	0	84.2	9.9	5.9	0	114.5	≤0.001
Technology makes treatment safer	14	15.8	7.9	58.8	3.5	86.1	0	0	11.9	2.0	114.5	≤0.001
Technology reduces nurses' workload	13.2	13.2	20.2	50	3.5	2.0	0	84.2	12.9	1.0	89.5	≤0.001
It is not easy to deal with technology	14	21.9	18.4	39.5	6.1	86.1	0	0	12.9	1.0	116.7	≤0.001
Technology distracting nurses' ability to communicate or bond with the patient	11.4	30.7	21.9	31.6	4.4	0	10.9	86.1	3.0	0	92.3	≤0.001
Collaboration in care between the patient, family and medical team can help patients live with technology safely	4.4	13.2	15.8	48.2	18	0	0	84.2	11.9	4.0	102.3	≤0.001
Technology can create an ethical dilemma	21.1	8.8	23.7	40.4	6.1	88.1	8.9	3.0	0	0	109.2	≤0.001
The inclusion of technology in care means that those involved in patient care need time	7.9	37.7	18.4	33.3	2.6	85.1	3.0	2.0	8.9	1.0	131.4	≤0.001
Technology is the priority, not the patient	41.2	17.5	23.7	14.9	2.6	13.9	1.0	85.1	0	0	85.3	≤0.001
Life-saving techniques in the ICU reduce the space needed to care for patients	12.3	51.8	11.4	22.8	1.8	84.2	12.9	2.0	0	1.0	114.3	≤0.001
Technology does not interfere with care	7	19.3	27.2	43	3.5	2.0	10.9	85.1	2.0	0	79.9	≤0.001
Technology makes patient care easier	4.4	11.4	8.8	71.9	3.5	0	1.0	84.2	13.9	1.0	124.1	≤0.001
The entry of technological machines often results in nurses neglecting patients	19.3	38.6	16.7	25.4	0	10.9	1.0	85.1	3.0	0	108.2	≤0.001
Application of modern devices keep the nurses often become frustrated	11.4	13.2	26.3	40.4	8.8	0	8.9	86.1	3.0	2.0	84.8	≤0.001
I think even with the help of technology, there is no longer any free time in nursing	15.8	21.9	28.1	28.9	5.3	2.0	2.0	94.1	2.0	0	96.6	≤0.001
The use of technology in nursing has raised the standard of the nursing profession	4.4	12.3	18.4	55.3	9.6	0	0	85.1	14.9	0	98.5	≤0.001

Table (3): Total score of the studied pediatric and adult critical care nurses' attitude Impact of Technology Uses in Professional Nursing Care (N=215).

Total score	Pediatric nurses N=(114)		Adult nurses N=(101)		Test of significance
	No.	%	No.	%	
Negative attitude	4	3.5	0	0	FET P=0.124
Positive attitude	110	96.5	101	100	
\bar{X} (SD)	109.71(15.44)		107.58(2.22)		t =1.145 P =0.149

FET: fisher exact test, t= independent t test, * Significant ($p \leq 0.05$)

Table (4): Total score of the studied pediatric and adult nurses' Perception of Caring Attributes (N=215)

Total score	Pediatric nurses N=(114)		Adult nurses N=(101)		Test of significance
	No.	%	No.	%	
Lower score	4	3.5	0	0	FE P=0.124
Higher score	110	96.5	101	100	
\bar{X} (SD)	179.94(24.19)		175.71(9.60)		t =1.72 P =0.08

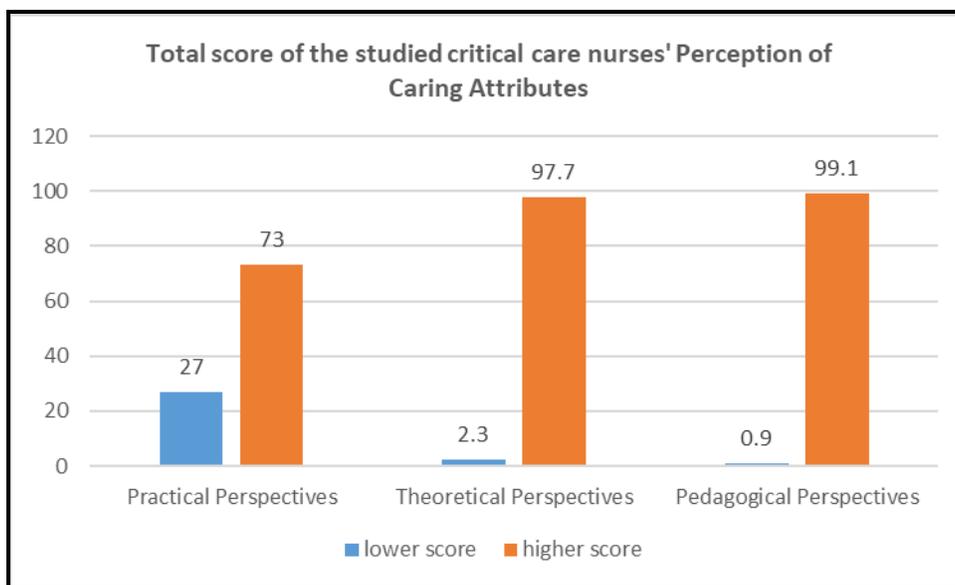


Figure (1): Total score of the studied critical care nurses' Perception of Caring Attributes subscales

Table (1): Demographic characteristics of the studied nurses illustrated in. It was clear that approximately half of nurses were in the age from 20 to less than 30 years (50% &46.5% for adult nurses) with the mean age for all nurses of 30.56±5.80. The majority of studied nurses were females (79.8% &100 % respectively). In addition, approximately half of the pediatric &adult nurses (45.6% & 46.5%) had less than 5 years of working experience. The majority of adult nurses (87.1%) replied that they are attending training programs about technology uses in

health care system compared to approximately one third (30.7%) for pediatric nurses.

Table (2): Illustrates the impact of technology uses on professional nursing care from perspective of pediatric and adult critical care nurses. It was noted that there were a statistical significant difference between pediatric and adult nurses in all items of the scale. Approximately two thirds of pediatric nurses (60.5% & 63.2% respectively) responded with agree that the technology uses in nursing care requires highly technical skills and the mastery of technology

helped the nurses to take control of their work environment compared to 84.2% & of adult nurses responded with uncertain and disagree in this point and the difference was significant. Additionally, the majority of adult nurses (86.1%) responded with strongly disagree with the statements that the technology makes treatment safer and it is not easy to deal with technology. compared to 14% for pediatric nurses.

Table (3): Presents the total score of the studied pediatric and adult critical care nurses' attitude toward impact of technology uses on professional nursing. This table shows that the pediatric and adult critical care nurses had positive attitude regarding technology use in nursing care. The difference not statistically significant ($p = \leq 0.149$) impact of technology uses on professional nursing.

Table (4): There is no statistical significant difference between adult and pediatric critical care nurses regarding perception of caring attributes as illustrated in As shown in the table almost all of pediatric and adult nurses had higher score of caring attributes (96.5% & 100% respectively).

Figure (1): illustrates total score of the studied critical care nurses' perception of caring attributes. It was obvious from the figure that the majority of nurses had higher score and positive perception regarding caring attributes subscales

Discussion

Caring in the ICU is compound and dynamic; proper nursing care is reflected the most important in this situation (Loesin & Kongsuwan, 2011). There are many different machine technologies hired to treat critically ill patients, as well as mechanical ventilators, pulse oximeter, electrocardiography machine, arterial blood gas machine and hemodialysis machines. Nurses in pediatric and adult critical care units use different machines and different technologies to save patient life. Therefore, the nurses require an enormous number of practical skills, effort, and competency when managing technologies pleasantly toward positive human health perspectives in the ICUs (Biswas et al., 2016).

The purpose of this study was to explore the effect of technology uses on nursing care and caring attributes from perspective of pediatric and adult critical care nurses. In the present study, intensive care unit (ICU) technology has employed in many health care settings to attain the best client outcomes such as mortality rate and declined hospital length of stay, decreased the costs of health care services and increase patient access to care. Technology has introduced as a way to provide operative ICU facilities to critically ill patients with reduced admittance, and improve patient care (Deslich &

Coustasse, 2014). Bilgic & Sendir, 2014 pointed that the usage of technology in ICUs emphasizes on information science and information technologies. In this study, separately from current knowledge, nurses' perceptions about the use of technology in ICUs were determined. Pediatric and adult critical care nurses were conveyed confident perception about the use of technology in nursing-care practices. Through ICU technology, nurses go to resolve the health issues of critically ill patients, nurses' tasks with their work, improve treatment, and reach patient wellness. This agreed with Bagherian et al., (2017) who mentioned that, there was affirmative association between the uses of technology and caring attributes; caring attribute scores of nurses were increased regarding the use of technology in nursing practice. In contradiction to this study, Schenk et al., (2018) who stated that caring effectiveness was observed to decrease slightly post-electronic health record implementation

The demographic profiles of the studied nurses illustrated that, the majority of nurses attending training programs about the technology uses in health care system. These decorative high qualified nurses are able to direct the critical thinking process, assessing client's condition and providing the right nursing intervention according to client's needs. Noone & Seery (2018) in their study found that a person having higher educational level can think scientifically, has skill to search for new knowledge and skills in the profession of nursing than the lower educational level. The present study revealed that, more than one third of nurses responded with agree that the uses of technology in nursing care requires highly technical skills and the mastery of technology helped the nurses to take control of their work environment. This finding was in the line with another study conducted by Wei et al., (2018) who illustrated that technology help to improve work environment, effective healthcare, and advance quality care.

In a comparative study conducted at the Intensive Care Unit by Gough et al. (2014) & Ozan & Duman, (2020), the nurses replied that technology strengthens their autonomy, speeds up, safe, and eases their work in the clinics where technology used less often. This result was in contrast with the current study who indicated that nearly half of nurses respond with strongly disagree with the statement that the technology makes treatment safer and it is not easy to deal with technology. Similarly, another study conducted by Samaher, (2011) who found that, nurses disagreed that the technology focused on equipment and technical skills only, which result in neglecting physical needs of patients. In the current study, the nurses believed that high technology

necessities high skills to holder. These results are inconsistent with findings of **Regmi & Thekkekara, (2020)** who assessed the nurses' perception about the advancement of technology in ICUs and noted that, nurses perceive innovative technology in ICU as valuable. The nurses stated their necessity for more training when using equipment with advanced technology.

The results of the existing study also detected that more than two thirds of nurses agreed that listening and talking to patients, allowing the patient to express his feeling and educating the patient about self-care are the most important practical aspect of caring . From the researchers' point of view, this may be due to the respondents would have educated this viewpoint from the ethics of the nursing profession. This result is consistent with findings of another study conducted by **Biswas et al., (2016)** who reflected that all human beings are caring in their characteristics that are integral to the practice of nursing profession

The findings of this study showed that there was a positive relation between nurse's gender, qualification and total mean scores about caring attributes and effects of technology uses on nursing care. From the researchers' point of view, this finding was due to the fact that the higher educated nurses should have high perception on caring because of their education may upset in varying attitudes on developing their clinical skills or knowledge. This finding was agreed with the study results of **Laila, et al., (2011)** who stated that, there was a strong relation between nurse's gender, qualification and caring attributes and effects of technology on care. Furthermore, these findings were in accordance with **Bagherian et al., (2017)** who found that, female nurses expressed positive perceptions about the use of technology in healthcare and estimated that more female than male nurses assumed that using technology styles nursing-care practices patient centered.

Overall, the current study findings displayed that technology uses in nursing confirms safety because it offers them with precise data about critically ill patients and aids in directing treatment. From this, we expect the pediatric and critical care nurses to work with persistently modernized technology and believe that they are interested in any revised style of ICU medical devices. Finally, our findings answer the current research questions and represented that the pediatric and adult critical care nurses have positive attitude about effect of technology on nursing care.

Conclusion:

The current study gives a small picture about the nurses' attitudes about health information technology. From the results of the current study, the nurses had positive attitude about the introduction and implementation of technology in nursing care and health care delivery system. In addition, nurses are worried about the limitation of technology and its impact on nursing care provided for adult and pediatric patients. The most common negative attitudes about technology uses were related to technology and safety of the treatment, easy to uses technology and ethical dilemma of technology and lifesaving procedure.

Recommendations:

1. Adequate training and continuous education with new electronic system and new machines with follow up is mandatory.
2. Integration of health information technology and application of nursing informatics tools in nursing curriculum are necessary.
3. Educational and training program are recommended to improve the overall nurses' attitudes about technology uses and advances caring attributes in nursing care.

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