

Health Information Technology in Nursing: Views and Attitudes of Nurse Managers

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ABSTRACT

Aim of this study was to determine nurse managers' views and attitudes towards health information technology. The study was planned as a mixed methods study. Sample of the study consisted of 52 nurse managers. Participants were selected from the nurse managers working at training and research hospitals of a university in Turkey. Content analysis was used for data obtained from face-to-face interviews, and data obtained from other data collection tools were analyzed by frequency, percentage distributions, means, and standard deviations. According to the results obtained from the study; respondents noted strengths of health information technology, such as easing workflow and minimizing medication errors through better documentation. Perceived weaknesses included long waits to obtain patients' medications when the system was busy, and time lost entering information into the system. Mean score for attitudes about health information technology was 4.90 (± 0.90) out of 7. Nurse managers experienced difficulties with learning and perceptions about the system, teaching a new system to team members, and adapting when a new system replaced the old one.

Keywords: Communication, health service management, informatic, information technology, nursing, nursing care

Hemşirelikte Sağlık Bilgi Teknolojileri: Hemşire Yöneticilerin Tutum ve Görüşleri

ÖZ

Bu çalışmanın amacı hemşire yöneticilerin sağlık bilgi teknolojilerine yönelik bilgi ve tutumlarının belirlenmesidir. Çalışma karma yöntem araştırması olarak planlanmıştır. Çalışmanın örneklemini 52 hemşire yönetici oluşturmuştur. Katılımcılar, bir üniversitenin eğitim ve araştırma hastanelerinde çalışan hemşire yöneticilerinden seçilmiştir. Yüz yüze görüşmeden elde edilmiş veriler için içerik analizi yapılmış olup, diğer veri toplama araçlarından elde edilen veriler sıklık, yüzde dağılımı, ortalama ve standart sapma ile değerlendirilmiştir. Çalışmadan elde edilen sonuçlara göre; katılımcılar sağlık bilgi teknolojinin güçlü yönleri olarak, iş akışını kolaylaştırma ve daha iyi belgelerle ilaç hatalarını en aza indirmeyi belirtmişlerdir. Algılanan zayıf yönler ise sistem meşgulken hastaların ilaçlarını almak için uzun süre beklemeyi ve sisteme bilgi girmenin zaman kaybını içermektedir. Sağlık bilgi teknolojisi ile ilgili tutumların ortalama puanı 7 üzerinden 4,90'dır ($\pm 0,90$). Hemşire yöneticiler, sistemi öğrenme ve algılama; ekip üyelerine yeni bir sistem öğretme ve eski sistemin yerine yeni bir sistemi yerleştirme ile ilgili güçlükler yaşadığını belirtmiştir.

Anahtar Kelimeler: İletişim; sağlık hizmeti yönetimi, informatik, bilgi teknolojisi, hemşirelik, hemşirelik bakımı

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I. INTRODUCTION

Health information technology (HIT) is used in preventing medical errors, improving health care quality, increasing administrative efficiencies and healthcare work processes, decreasing paperwork and unproductive or idle work time, reducing health care costs, and expanding access to affordable care. HIT also enables health care professionals to extend real-time communications on health informatics. Despite all that, HIT also brings some adaptation difficulties. In addition, potential problems are associated with the implementation and use of HIT. Wide utilization of information technology in the health sector has changed the attitude within health and health services, because electronic health services have eased and accelerated the efficient sharing of health information. As a result, enormous and costly investments have been made in HIT infrastructure (Piscotty et al. 2015; Cipriano et al. 2013; McBride et al. 2012; Johnson 2012; Buntin et al. 2011; Nir et al. 2011; Alquraini et al. 2007; Ammenwerth et al. 2003).

Considering the limited budgets and resource constraints of health care organizations, appropriate information technology investments should be in line with the attitudes, perceptions, and intentions of managers and employees of health care organizations. Inappropriate technology choices and adaptation problems can cause additional costs due to the impact on time and human resources. For these reasons, it is important to determine factors influencing the attitudes, behaviors, and intentions of health care managers that will affect health system performance in positive manner. There are numerous studies in the literature on adaptation of HIT. The most commonly cited studies investigate managers' intent, attitude, and behavior as well as the system's ease of use, by using adaptation models (Piscotty et al. 2015; Johnson 2012; Young et al. 2010; Alquraini et al. 2007; Moody et al. 2004; Venkatesh et al. 2003).

A major challenge facing nurses today is the demand to provide safe and high quality care while being efficient and cost effective. At the same time, there is continuing implementation of technology in various aspects of nurses' lives. Because nurses are important members of the hospital health care team, spending more time with patients and providing patient care, they also play a key role in improving the quality of care and decreasing health care costs. In the context of clinical decision support systems, nurses use electronic medical records to develop standard nursing care plans, and employ computerized physician order-taking systems as well as clinical protocols and procedures. The most important benefits of a "standard nursing care plan" include creating a common language in nursing practice and nursing education, in order to evaluate and measure the results of patient care, establish data for nursing studies, and provide information flow among nurses (Piscotty et al. 2015; Monteiro 2015; Oliveira, Peres 2015; Bilgiç, Şendir 2014; Seçginli, Erdoğan 2012). Having positive attitudes, perceptions, intents, or/and views about using the HIT leads to good quality nursing care and prevents medication errors in nursing practice. Therefore, it is important to determine nurses' perceptions, attitudes, or views about HIT in their practice, so organizations can target specific system designs or workflow changes to improve nursing care. In a study by Piscotty et al. (2015) about the impact of health care information technology on nursing practice, it was found that nurses who use the electronic reminders more frequently and have higher perceptions about the impact of HIT on their practice have less missed nursing care than nurses who use the reminders. Also, their study supported perceptions of the impact of HIT on mediating the relationship between use of nursing care reminders and missed nursing care. According to a study by Erdemir et al. (2015) most nurses stated that they had positive perceptions that the influence of computers in the care process would improve the quality of care and nursing documentations. However, nurses have been found to resist computerization, doctors often dislike working with health information systems, and nurses frequently complain about increased workloads due to a loss

of overview, slower working routines, and problems entering and locating information (Alquraini et al. 2007). The study of Hikmet et al. (2006) reported that, along with technology grievances, nurses were also displeased with the level of organizational commitment to employee relations, work coordination, and streamlining processes, as well as issues stemming from staffing shortages.

In Turkey, the literature discussing this issue is limited. We hope the results of this study can be used by hospital managers, as well as nurse managers, to plan and revise their perceptions of the role of HIT in efficient use of health care resources and in good management through effective decision making.

II. METHOD

2.1. Design and Sample

Objective of this study was to determine nurse managers' views and attitudes towards health information technology. This investigation was planned as a mixed methods study. Participants were selected from the nurse managers working at training and research hospitals of a university in Turkey. The hospitals were accredited by the Joint Commission International (JCI). The researchers (SCC, IU) obtained informed consent and permission from the participant nurse managers in accordance with the guidelines of the Declaration of Helsinki. There were 85 nurse managers, however 52 nurse managers agreed to participate in the study.

This study was carried out in two stages. During the first stage, the researcher (SCC) held face-to-face interviews with 15 managers to investigate the general problems and adaptation problems of nurses in using HITs with "Semi-Structured Questionnaire". Participants in the face-to-face interviews were selected participants until reaching data saturation according non-probabilistic sampling. Data saturation obtained when similar patterns were provided by the participants. For the second stage, the "Personal Information Form" and "Health Information Technology Using Questionnaire" were used for 52 nurse managers.

2.2. Data Collection Tools

Three main data-collection tools were used in the study: "Personal Information Form" to collect nurse manager characteristics, "Health Information Technology Using Questionnaire," and "Semi-Structured Questionnaire." Researchers tested the questions in the "Personal Information Form" and "Semi-Structured Questionnaire" for structure and clarity in a pilot study with five nurses. No need for revisions to the questions was indicated.

The "Personal Information Form" consisted of questions on age, gender, marital status, education, job position, having certificate in information technology, computer using status, internet using status, level of information technology use, and views about HIT.

A questionnaire originally titled "The Factors Affecting Information Technology Use," developed by Hikmet (1999), contains 69 items. In 2015, Tarcan (2015) tested the validity and reliability of this scale in a Turkish setting. Researcher adapted the scale to the Turkish setting, rearranged it into 60 items, and revised its name to "Health Information Technology Using Questionnaire." The first 49 questions are Likert-type items with seven steps. The participant nurse managers were asked to respond to statements in the questionnaire, with the possible score for each item ranging from 1 to 7 points. "Not Agree" was assigned a value of 1; "Neutral" was assigned a value of 4; and "Completely Agree" was assigned a value of 7. Questions in this questionnaire dealt with using a computer, internet, and information

technology in the workplace. A higher mean score on this scale indicates a higher positive attitude (Tarcan 2015). Remaining 11 questions of the questionnaire measured how much time participants spent using information technology. These questions were not answered by the majority of participants because they had the difficulty to estimate the amount of time allocated to information technology using in overall works. That's why these questions were excluded from the present study.

The "Semi-Structured Questionnaire" was used as a qualitative part of the study to collect information on the reasons for computer use in the workplace, views about information technology, difficulties experienced with using information technology, methods of coping with these difficulties, and the need for education in information technology.

2.3. Implications of the Study

The study was carried out between July 10 and August 10, 2015, and consisted of two stages. First, the researcher (SCC) conducted face-to-face interviews using the "Semi-structured Questionnaire." The "Personal Information Form" and "Health Information Technology Using Questionnaire" were distributed later and picked up after completion.

Dates and times were arranged for face-to-face interviews with the 15 participants, all held in nursing rooms. Before beginning the interviews, the aim of the study was explained to participants. Each participant was assigned a number to be used instead of their name, and all interviews were recorded on tape. Data were also gathered with the "Semi-structured Questionnaire." Questions were open-ended and the researcher ensured that each question on the data-collection schedule was adequately addressed. Data transcribed from the interviews were validated through comparison with the notes of the researcher and the tape recordings.

After face-to-face interviews, the researchers (SCC, IU) distributed and collected the "Personal Information Form" and "Health Information Technology Using Questionnaire" in a plain yellow envelope for each of 52 participants. Completing these questionnaires occupied an average of 15 minutes.

2.4. Data Analysis

Content analysis was used for the data obtained by face-to-face interviews. The units of analysis for this study were words or concepts, themes, and the number of subjects who described the same concept or theme. Data transcribed from the interview discussions were grouped by themes and concepts.

Data obtained from the "Personal Information Form" and "Health Information Technology Using Questionnaire" was analyzed by frequency, percentage distributions, mean, and standard deviation using Statistical Package for the Social Sciences for Windows.

2.5. Ethical Considerations

All necessary written approvals were obtained from the administrative departments and Hacettepe University, Non-interventional Clinical Researches Ethics Board before starting data collection.

III. RESULTS

In this study, all of the participants were female, with a mean age of 37.8 ± 6.9 ; 76.9% of the participants were married and the remaining 23.1% were single. The majority of

participants (88.5%) were graduates of four-year nursing programs at various Turkish Universities, while 7.7% of them had master's degrees in nursing. Only two participants were graduates of vocational health high schools and two-year colleges of nursing.

A great majority (84.6%) were nurses working as nurse managers (head nurses) in inpatient clinics including internal medicine, surgery, operating room, intensive and critical care units. The remaining 15.4% were working as supervisor nurses. The majority of participants (78.8%) did not have a certificate in information technology, although 21.1% had this certificate. Most of the participants (98.1%) said that they could use the internet and computer at their workplace. In addition, a few participants stated that they had enough knowledge about office programs (38.5%), photocopying and printing machines (25.0%), audio recording and playback devices (19.2%), networking (computer networks), computer hardware and answering machines (15.4%), computer operating systems and computer software (11.5%), and databases (MySQL, Oracle, Access, etc.) (3.8%) as tools of information technology. In addition, 60% of participants stated that they did not need any training in HIT.

Four descriptive themes emerged from the data obtained by face-to-face interviews of this study: (1) reasons for using a computer in the workplace; (2) views about HIT; (3) difficulties with using HIT; and (4) methods of coping with the difficulties.

Theme One: Reasons for using a computer in the workplace

Participants stated that they used computers in the workplace for different reasons: preparing medicine and material procedures; following the results of diagnostic procedures on their patients; having consultation reports and infection approvals and monitoring vital signs; other nursing services such as the nursing care process, patient discharge education, patient admission and discharge procedures, procedures about patient surgery and the operating room, and other information about their patient. In addition, the participant nurses said that they used information technologies for the purpose of quality system documentation, getting information about medicine and disease from the internet, learning procedures related to employee rights, tracking expenditure data and input, and preparing materials for in-service training of other nurses.

The following are examples of participants' responses about reasons for using computers in the workplace: "The whole system is set up on computers. We do all of our work such as gathering laboratory data, radiology, material requirements of patients, and expenditure data for nursing services and initiatives by using computers. Everything is done with computers," "We put all expenditure and input data about patients into computers, "All procedures need computers," and "Computers have become our life."

Theme Two: Views about health information technology

Participants stated that HIT has many strengths, such as: enabling everyone to access patient information both quickly and easily; minimizing medication errors due to greater ease of following written orders for medication; transferring and storing information; preventing paper waste; increasing communication and development among nurses and other departments; providing continuity of care; reducing the workload and providing written documents that can be used for legal issues. Participants also noted some weaknesses of HIT. For example, they mentioned having to wait a long time to obtain medicine prescribed for their patients when the system was busy; HIT caused time loss due to entering information into the system; some participants had failed to reach vital and important patient information

from paper files near their patients, when it was urgently needed, causing inefficient use of the limited time spent with their patients.

The following quotations are examples of participants' views about HIT: "I'm away from my subject, but having quick and easy access of it. But we remain dependent on someone else if it has problem. Our medicine treatments were disrupted yesterday. We tried to obtain medicines from the pharmacy all day due to a problem with it"; "We might be seen as those workers who are always working with computers or devices. Especially, we decline contact with patients if it has a problem. Namely, we could spend less time with patients"; "A lot of manually written papers were lost and discarded. We used to use paper-based patient files mostly to monitor vital signs of our patients"; "We could find and follow all information. Especially, the health team could share all information, so it has a positive impact for patients. We could reach all information about a patient when we just click a button on the computer. But each health staff member could access information that is needed to carry out their own jobs (confidentiality). For example, a secretary could not reach our information, so it is safe"; "Medication management is important for us. We could easily obtain medicines. We could follow a patient's medicines and the expiration dates of medicines, and this is important for preventing medication errors"; and "We theoretically learned nursing care processes at our schools, but now HIT allows us to practice our knowledge for the benefit of our patients at clinics."

Theme Three: Difficulties with using health information technology

According to the participants in this study, the difficulties experienced with HIT were: (i) difficulty in learning and understanding of the system; (ii) inability to work and being dependent on someone else when information technologies do not work or there are power outages; (iii) difficulty in teaching a new system to all team members and adapting them to the new system when the hospital management replaced the old system.

The following are sample statements on how and why participants encounter difficulty using HIT in the workplace: "I learn and perceive new system, this is difficult and too late for me. I do not know where to enter information, what to do with the system, and I do not even know its rules. I myself figured out what to do and took my own reminders to use it efficiently. My younger colleagues understand it easily"; "The experts gave us training about the new system when the older system was replaced with a new system. Then I am supposed to give training about this new system to staff members who did not attend the training seasons. Giving training is very difficult for me"; and "There is an internet limitation. Only certain computers have internet access in the doctors' and/or the nurses' room. We are aware of people, and we know very well how to use internet and how much to use the internet. Eventually, we are all educated."

Theme Four: Methods of coping with the difficulties

The participants stated that they followed different ways to solve the problems they encountered with HIT. The most common methods participant nurses used for coping with the difficulties were: (i) reporting the problem to the system management or nursing management; (ii) using the old system until the problem could be solved; (iii) asking for help from other colleagues; (iv) teaching themselves by reading the company booklet or continuing to try new ways until the problem was solved, if they did not have enough information about a system or device; and (v) not solving the problem but reprioritizing the work with temporary solutions such as sharing devices.

Examples of participants' statements on coping methods are the following: "If a system

does not work, we try to use the older system [if it is still in use]. For example, we had a problem about electronic medication management system last week. I manually wrote patients' medicines on an order form for obtaining medicines from the hospital pharmacy, then a porter took this form to the hospital pharmacy and he brought all patients' medicines to my clinic. In addition, we sent an e-mail about this problem or called the system management"; and "I re-plan my work to cope with the problem. For example, if more computers are needed at the same time and but there is only one computer functioning well, then I give an order to use this computer for the person who is most in need."

Table 1 summarizes the 52 participants' views on HIT, obtained by the "Personal Information Form." According to the results, most participants (n=50) agreed with the statements about "Making information more easily accessible," "Providing an analysis of magnetic resonance imaging," and "Allowing the monitoring of medicines and other medical equipment and supplies." In addition, 18 (34.6%) and 13 (25%) of the participants disagreed with statements about "Causing hazards for patient privacy and safety" and "Reducing the autonomy of nurses," respectively.

Table 1. Views of Nurse Managers about Health Information Technology (n=52)

Views about Health Information Technology	Agree		Partly Agree		Disagree	
	n	%	n	%	n	%
Making information more easily accessible	50	96.2	2	3.8	-	-
Providing an analysis of magnetic resonance imaging	50	96.2	2	3.8	-	-
Allowing the monitoring of medicines and other medical equipment and supplies	50	96.2	2	3.8	-	-
Providing an analysis of laboratory tests	49	94.2	3	5.8	-	-
Allowing the entry of orders and treatment outcomes	49	94.2	2	3.8	1	1.9
Making inventory control	49	94.2	3	5.8	-	-
Supporting quality management	49	94.2	3	5.8	-	-
Providing for more effective material orders and their follow-up	49	94.2	3	5.8	-	-
Compiling data for research	49	94.2	3	5.8	-	-
Providing more effective planning for material requirements	48	92.3	4	7.7	-	-
Making easier communication between staff members	48	92.3	4	7.7	-	-
Allowing staff to give better quality medical services	45	86.5	7	13.5	-	-
Preventing the loss of time	44	84.6	8	15.4	-	-
Reducing costs	43	82.7	9	17.3	-	-
Facilitating creation of nursing care standards	43	82.7	7	13.5	2	3.8
Providing patient care planning	42	80.8	10	19.2	-	-
Increasing the quality of nursing documentations	42	80.8	9	17.3	1	1.9
Providing computer-assisted medical decision making	41	78.8	11	21.2	-	-
Saving time for nursing data storage	39	75.0	10	19.2	3	5.8
Providing more effective planning for the operating room and diagnostic unit	35	67.3	15	28.8	2	3.8
Ensuring individualized care for patients	34	65.4	16	30.8	2	3.8
Preventing paperwork for nurses	33	63.5	15	28.8	4	7.7
Providing more time to spend on patient care	30	57.7	16	30.8	6	11.5
Providing to measure employee performance	30	57.7	18	34.6	4	7.7
Reducing the autonomy of nurses	17	32.7	22	42.3	13	25.0
Causing hazards for patient privacy and safety	13	25.0	21	40.4	18	34.6

Table 2 shows mean scores of attitudes of the 52 participants about computer, internet, and information technology that are the subcategories of HIT in the "Health Information

Technology Using Questionnaire.” It was observed that participants’ mean attitude scores about the subscales of computer, and internet, and information technology were 5.12 ± 1.09 , 5.25 ± 1.12 and 4.33 ± 0.91 , respectively, while the total scale mean was 4.90 ± 0.90 . These results indicated that the participants have positive attitudes toward all subcategories of HIT.

Table 2. Attitudes of Nurse Managers about Health Information Technology (n=52)

SCALES	Mean	Std Dev.
Subscales		
Computer using	5.12	1.09
Internet using	5.25	1.12
Information technology	4.33	0.91
Total Scale	4.90	0.90

IV. DISCUSSION

HIT is expected to have a great impact on health care practice in the coming years. The use of HIT in developed and some developing countries has already become a reality. Nursing services are one area that has been greatly affected by HIT. However, some nurses have found HIT cumbersome and they resist computerization, seeing computerized health information systems as dehumanizing, confusing, and uncaring (McBride et al. 2012; Alquraini et al. 2007). In a study by Alquraini et al. (2007), the main purpose was to find out the most important determinants of the attitudes of nurse managers regarding the vital components of HITs, defined as: internet use, computer use, and HIT itself. The study also investigated problems that nurse managers faced with HIT and methods used to cope with these problems.

It was interesting to find that some participants reported they did not need any education about information technology, although most participants agreed that they did not know too much about information technology such as computer networks, hardware, or operating systems. This finding is confusing, because nurse managers do not ask for any education about information technology although they actually need it. Several researchers had reported that a large majority of the nurses were not comfortable and experienced with computer technology (Erdemir et al. 2015; Takvorian 2015; Alquraini et al. 2007) and our findings are in concurrence with those studies. Nurses, especially nurse managers, play a significant role in HIT training. Most of the HIT training for nurses is performed by the manager nurses, and this role continues with providing refresher sessions, new employee training, and support during clinical system upgrades and improvements.

HIT includes computerized physician order entry, electronic medical records, bar coding at medication dispensing, automated dispensing of medicines, clinical decision support systems, robots for medication dispensing, electronic medication administration records, bar coding at medication administration, developing standard nursing care plans, and clinical protocols and procedures (Takvorian 2015; Bilgiç, Şendir 2014; Seçginli, Erdoğan 2012; McBride et al. 2012; Nir et al. 2011). Also, in this study, all participants stated that they performed all patient care services and other nursing services using HIT. One participant emphasised this truth by saying: “Computers have become our life.”

According to results of both face-to-face interviews and the “Personal Information Form” (Table 1), all nurse managers stated that HIT had many more strengths than weaknesses. Also, Table 2 showed that the mean score for general attitudes towards HIT in three hospitals was 4.90 ± 0.90 (range: 1-7) for all participants, indicating that nurse managers had positive attitudes towards HIT. In addition, most participants stated that they had positive

views about using HIT. This is a significant finding, because nurse managers who have more positive attitudes and views towards HIT in their practices have a tendency to become adapted HIT easily and to make fewer medical or management errors and give more quality care than nurse managers with negative attitudes and views towards HIT. These findings are consistent with those other studies (Alquraini et al. 2007; Moddy et al. 2004). Current results also suggest that nurses in Turkey are willing to use HIT to improve the quality of patient care.

In this study, it was found that nurse managers had experienced problems or difficulties with learning HIT, running the systems, and adapting to new systems. In addition, all nurse managers stated they reported problems about HIT to the system management. It is important to know the views of nurses, who are considered as end-users, in order to define the problems faced with HIT use. The results gained from this study were also useful in determining nurse manager-users' specific needs, the problems they face, and methods they use to cope with the problems, with respect to modifying the HIT. Every negative result can be a treasure because it will be a guide to better implementation strategies and HIT design.

Finally, if a new HIT is implemented, it is important to measure the changes in nurses' attitudes and to identify factors related to negative attitudes and adaptation to a new HIT – especially in nurses and other hospital managers, who have a key role in successful implementation of HIT.

V. CONCLUSION

This descriptive and qualitative study on HIT yielded important results on the reasons for using computers, views and attitudes towards HIT and difficulties experienced, and coping methods used by nurse managers facing these difficulties. The results showed that nurse managers had positive attitudes about using HIT, although they experienced various problems and difficulties with HIT. We suggest that a study should be conducted to determine positive and negative attitudes of non-manager nurses towards HIT, since HITs are used not only by nurse managers but also all health care professionals. Secondly, it is essential to let personnel participate in important decisions and to seek their support. Providing professional support and appropriate leadership would also accelerate the adaptation of personnel to new technologies. Thirdly, it should be kept in mind that when managers or staffs display resistance to technology use, regardless of their reasons, this negatively affects system performance. Written manuals on “how to use HITs efficiently” might be helpful in lessening the resistance of managers and users to HITs and in facilitating the adaptation of all stakeholders to new technologies.

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