Original Research Paper

Implementasi of technology acceptance model (TAM) in electronic documentation of nursing care: phenomenology explorative

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Abstract

Incomplete medical record documentation affects the quality of service in hospitals. The migration of SIMRS is intended to allow hospital services to be integrated. The use of electronic medical records as a nursing care documentation tool needs to be evaluated in terms of the acceptance of technology through three constructs: the effect of benefits, the effect of ease of use of the system, and self-confidence in computing ability. The study aims to explore the nurses' experiences of the influence of the benefits of using technology, the ease of use of technology, and nurses' self-confidence when using technology. This study used qualitative methodology with an exploratory phenomenological approach. Data were collected through FGDs with 12 participants selected by purposive sampling technique and consultation with information technology and nursing management experts. Data analysis used the Collaizi Model. The results obtained from this study indicate that the electronic care documentation system must consider the security system of the medical record and that obstacles to operating the system must be anticipated. Guidelines should be made for the application of 3S nursing care in EMR. Adapting to technology influences self-confidence in computing ability, the belief that technology can complete tasks, the usefulness of technology, and the ease of use of electronic documentation technology. It can be concluded that the evaluation of technology acceptance as early as possible is very important to support the successful use of information systems and provide input for management and policymakers in understanding the process of adaptation to new technologies and the creation of practical guidelines for the successful implementation of information systems.

Keywords: computer self-efficacy; nursing care documentation; technology acceptance model implementation

1. Introduction

The application of information systems in the nursing documentation process is a strategy that can help nurses eliminate duplication of patient records, meet the goal of completeness of documentation, increase nurse satisfaction with nursing documentation, improve readability because it no longer uses handwriting, provide all clinical information in one location, and reduce error rates in documentation and treatment (Jedwab et al., 2022a; McCarthy et al., 2019; Tubaishat, 2019). Electronic documentation is not only useful in improving document completeness, but it is also important for saving hospital operational costs. Implementing electronic health records (EHR) can result in net cost savings of more than $81 billion annually across the United States (Atasoy et al., 2019). Electronic health records can reduce patient care costs by approximately $731 per hospitalized patient. Nurses need skills, knowledge, intention, and behavior to use electronic documentation effectively. The successful application of electronic nursing documentation relates to nurses' attitudes toward new system changes (Aldosari et al., 2018).

Documenting using an Electronic Medical Record (EMR) shows a statistically significant increase in the completeness, accuracy, and speed of data access with electronic-based information systems

compared to paper-based systems (Durodolu, 2016). Electronic Medical Record enhances service quality and patient safety (Firdaus, 2020; Manca, 2015). The success of an information system is not only determined by how the system can process input and produce information properly. Its suitability for the work environment also influences it. Identifying the necessary prerequisites before implementing EMR will help improve its implementation (Ahmed et al., 2020). Acceptance of technology use is the main key to measuring the success of a system (Taherdoost, 2019).

The Technology Acceptance Model (TAM) is an accepted model that is considered suitable for explaining how users take a system (Kinanti, 2021). The TAM concept considers two main factors, namely perceived usefulness and perceived ease of use, as related (Surendran, 2012). Perceived ease of use is defined as the extent to which a person believes in using a technological system to improve their performance, while perceived ease of usefulness is defined as the extent to which the user believes in the system's ease of use (Zaman et al., 2021).

Technology acceptance in the implementation of EHRs by nurses has been measured in 15 hospitals in Jordan (Tubaishat, 2018). The results stated that the ease of use of technology is influenced by experience and skills in using computers. This technology's ease of use will increase nurse performance efficiency (Tubaishat, 2018). Computer self-efficacy (CSE) is one of the factors that can influence individuals to use technology. The skills of using computers among nurses should be introduced to students so that nurses have self-efficacy that is useful in using electronic documentation in their workplace (Kalayou et al., 2020).

Nurse self-efficacy is important because it can determine the success of use and improve the quality of nursing documentation and services. Factors that influence CSE are self-confidence to be able to use technology, being interested in and understanding technology, and often using technology (Dwisatyadini et al., 2018). Individuals with high self-efficacy will confidently enter stressful situations so that they can withstand stress reactions in adaptation to changes in the use of technology (Mohammadi Firouzeh et al., 2017).

The documentation applied in private hospitals in Semarang City is still based on paper. Many obstacles are faced, such as incomplete documentation, lost files, and delayed services due to waiting for complete files. Nurses' workload to carry out documentation increases because many forms must be filled out. Various efforts made by hospital management in collaboration with vendors to realize digitalization through hospital software are urgent to improve the management of administrative, clinical, marketing, financial, and facilitation services. Flow training activities and user training hospital system were conducted by the vendor and followed by all nurses to introduce the system. EMR implementation is a big challenge for hospitals because it involves many parties in terms of management, users, and infrastructure. Changes in the hospital management information system (SIMRS) from the old system to the new system require preparation in terms of infrastructure, organization, and technology users (Kinanti, 2021). Considering the description above, SIMRS is needed to improve hospital services, especially nursing ones. The readiness of nurses to use technology needs to be explored more deeply so that the benefits of technology that management wants to achieve in order to improve hospital business processes can be optimally realized.

This study aims to assess the implementation of the Technology Acceptance Model (TAM) in electronic nursing care documentation by exploring nurses' perceived usefulness, perceived ease of use, and computer self-efficacy in the use of electronic documentation implemented for one month in a private hospital in Semarang to explore experiences and ideas related to the system.

2. Research Methods

This research is qualitative with the Explorative Phenomenology Approach. Data collection was carried out through Focus Group Discussion (FGD). Focus Group Discussion was conducted twice,

with 60 minutes per session. There were 12 participants in the FGD. Researchers used purposive sampling to select participants. Selected participants were based on the criteria set by the researcher so that the participants were homogeneous, namely S1 nurses who were willing to disclose experiences, thoughts, and ideas about the implementation of TAM, nurses who used electronic documentation systems, nurses who had attended user training on nursing care documentation, able to communicate and were cooperative. The research instrument is the researcher himself, who has been validated by conducting role-play FGDs outside the sample of research participants and declared feasible as a researcher.

Ethical approval for the research was obtained from a private hospital in Semarang City with the number 14/KEPK/IX/2022 and from Universitas Karya Husada with the number 132/KEP/UNKAHA/SLE/I/2023. Expert consultation was conducted as data triangulation from various sources, namely from information technology experts and nursing management experts, to obtain direction and input on the acceptance of technology systems which were then formulated in implementing the technology acceptance model. Data analysis using the Colaizzi model (Shosha, 2012). The results of data analysis with this model are guaranteed credibility and reliability because they go through a rigorous and robust data analysis series that allow researchers to uncover emerging themes and their interrelated relationships. In phenomenological research, researchers can view the use of this model as a logical and clear process where the underlying structure of experience can be explored (Wirihana et al., 2018).

3. Results and Discussions

3.1.Results

The Technology Acceptance Model used to explain user acceptance of this electronic nursing care documentation information system includes two main factors, namely perceived usefulness (PU) and perceived ease of use (PEOU), as well as other supporting factors, namely computer self-efficacy (CSE). Based on the results of the data analysis, five themes related to the implementation of TAM in electronic nursing care documentation were identified.

Table 1. Demographic data of participants

No	Participant Name (Initial)	Age of Participant (years)	Education	Length of work (years)	Place of work	Gender
1	P1 (FH)	42	S1 Ners	23	Nursing Committee	P
2	P2 (FO)	44	S1 Ners	26	PJ Services	P
3	P3 (R)	37	S1 Ners	16	Managing Nurse Rawat Inap	P
4	P4 (FW)	35	S1 Ners	15	PPI Committee	P
5	P5 (DN)	45	S1 Ners	12	PJ Services	P
6	P6 (HP)	35	S1 Ners	16	Inpatient Nurse	P
7	P7 (YM)	27	S1 Ners	3	Outpatient Nurse	L
8	P8 (DR)	45	S1 Ners	26	Inpatient Nurse	P
9	P9 (AN)	42	S1 Ners	22	Installation Head	L
10	P10 (HF)	42	S1 Ners	22	PJ Services	P
11	P11(MC)	44	S1 Ners	26	Inpatient Nurse/CI	P
12	P12(AK)	35	S1 Ners	11	Inpatient Nurse	P

P= female L=male

Three themes discussed perceived usefulness: theme 1 (Understanding the electronic nursing care documentation system), theme 2 (Application of nursing care documentation in electronic medical records), and theme 4 (The usefulness of technology in electronic documentation). One theme discussed perceived ease of use, namely theme 5 (Ease of using technology in electronic documentation), and

another theme discussed Computer Self Efficacy, namely theme 3 (Self-confidence in computing ability in nursing care documentation).

The characteristics of the participants involved in this study in the table 1.

Analysis of Table 1 shows that the demographic data of the participants in this study are nurses who come from various career levels, namely implementing nurses in inpatient (*ranap*), outpatient (*rajal*), Clinical Instructor (CI), nurses in charge of services, head of Installation, nurses in the PPI Committee, nurses in the Nursing Committee. The participants' educational background is S1 Ners Nursing. Based on age level, of the 12 participants, the youngest was 27 years old, and the oldest was 45 years old. Then the length of work of nurses is at least three years, and the longest is 26 years. Participants come from various work units: four people from inpatient care, two nurses in outpatient care, one from the Nursing Committee, one from the PPI Committee, 2 PJ Services, and one Head of Installation. From the demographic data table, the participants' backgrounds are all S1 Ners graduates. Educational background is related to understanding and knowledge of SIMRS. Thus, the higher the level of education, the higher the preference for using SIMRS (Pratami, 2018).

Use of SIMRS (Pratami, 2018). Data on the age group is known to be the lowest at 27 years old and the highest at 45 years old. Different age groups have different perceptions. In this case, the higher a person's age, the lower their perception of SIMRS, and vice versa (Pratami, 2018). The influence of older age tends to encounter more difficulties when processing new or complex information due to the decline in cognitive and memory abilities associated with the aging process. This will affect their learning of new technology (Budiarto, 2017). Research from Gunawan (2018) also states that the male gender has a higher level of significance in accepting smart city technology than the female gender.

3.1.1. Perceived Usefulness
Theme 1: Understanding of Electronic Nursing Care Documentation System
Subtheme 1: Definition of Electronic Nursing Care Medical Record

Electronic medical record (EMR) is defined as a structured computer-based recording system to record all nursing activities from assessment to evaluation, integrated with other Professional Care Providers (PPA), integrated with the billing process, and integrated with the BPJS system, which is designed for the needs of patients in the hospital. Electronic medical records shorten documentation time.

"..a computer-based recording system to record all nursing activities" (participant 1).
".. integrated with other PPAs, this documentation is only designed for the needs of patients when hospitalized in that hospital" (participant 10).
".... is integrated with the billing process and BPJS system" (participant 11).

Subtheme 2: Electronic Medical Records Security System

Security systems in electronic medical records are steps that can be taken to secure patient data and ensure patient safety. These steps include not lending passwords and usernames to other health workers, regularly changing usernames and passwords, logging out of the device when not in use, identifying the device used, encrypting data with cloud storage, and limiting access rights.

"... not lending our passwords and usernames to others and logging out immediately when not in use" (participant 1)
"... passwords and usernames are changed regularly every three months..." (participant 3)
"by identifying the devices used and access rights" (participant 4)
"...data encryption, data is stored in the cloud so that our important data is not lost when our device is damaged, or a disaster occurs" (participant 12)

Subtheme 3: Constraints of Using Electronic Documentation

The obstacles faced by nurses in using electronic documentation in the unit are problems with the system, including difficulties in accessing the system (poor internet connection, EMR system down, takes a long time to open medical records), which have an impact on services in the form of delays in work, not being ready to face system changes, limited resources, imperfect system integration, and non-compliance of nurses in documenting nursing care in electronic medical records.

"There are problems with the nurses' non-compliance in filling in the data..." (participant 3)
"... friends are not ready to accept the change from manual to digital" (participant 6)
"Human resources in the SIMRS unit are limited...." (participant 8)
"System integration is not yet perfect. ....." (participant 9)
"Poor internet connection disrupted service" (participant 11)

Theme 2: Application of Nursing Care Documentation in Electronic Medical Records

The implementation of nursing care documentation in the EMR is guided by the Indonesian Nursing Diagnosis Standards (SDKI), Indonesian Nursing Intervention Standards (SIKI), and Indonesian Nursing Outcome Standards (SLKI) or also known as 3S which use a checklist system in the EMR, that is a standard for compiling and recording the provision of nursing care.

"starting from the initial assessment, all use the checklist system .... (participant 2)
"standards for compiling and recording the provision of nursing care using 3S" (participant 4).
"Standards of care that have been facilitated by diagnostic standards, outcome standards, intervention standards which are divided into categories and subcategories" (participant 12).

Thema 4: Technological Efficacy in Electronic Documentation

The usefulness of technology in the nursing field is based on the belief that using technology will improve performance at work. This usefulness will reduce the workload of nurses related to documentation so that nurses have more time to spend with patients; related to the costs, benefits, and value of the hospital; work gets done faster; human errors can be reduced, and it can be used for performance evaluation; documentation can be done anywhere and anytime by people who have access; data for reporting is available faster and can be analyzed immediately, facilitating communication so that treatment decisions are also made faster.

"lowering nurses' workload, reducing human errors...". (participant 1)
"Considering cost-benefit and value, we will feel the savings we can get". (Participant 2)
"...a reflection of my performance every day" (participant 4)
"...facilitate communication, data can be accessed anytime, in shorter time...." (participant 9).

3.1.2.Perceived Ease Of Use
Theme 5: Ease of Adapting to Technology

The ease of implementation use of technology in nursing care documentation is due to the user's belief that this system does not require hard effort as long as it is learned continuously. This ease is obtained, like the saying "*practice makes perfect*". Initially, it is not easy, but if used daily, it becomes easy. Ease is influenced by motivation, willingness, and age (young age is more exposed to technology).

As the saying goes, "practice makes perfect" There must be problems and challenges in the beginning, such as technical obstacles, but by constantly practicing, we can become skilled" (participant   1)
"Whether something is easy or not depends on the level of understanding of each person, technology will facilitate the work of nurses. It is only about intention" (participant 2)
"Influenced by motivation, age: young people are more exposed to and use a variety of technologies" (participant 3

3.1.3. *Computer Self Efficacy*
Thema 3: Nurse's Confidence in Computational Ability

The nurse's confidence in computational ability is confidence in a person's ability to carry out his or her duties. This confidence is strengthened by considering the experience of other hospitals in implementing EMR, efforts to understand EMR, and support from management and friends. The theme of nurses' self-confidence in computational ability consists of two subthemes: adaptation to technology and self-confidence to operationalize computers.

Subtheme 1: Adaptation to Technology

Nurses adapt to technology in various ways, such as: learning to use a new system, like when we have a new cellphone, making a scheduled study group every day, making small notes, practicing with the Person in Charge (PIC) of the room and the Hospital Management Information System (SIMRS) officer, opening manuals, watching video tutorials, instilling positive thoughts about being able to use the system.

"Described as a new cellphone needs time to learn" (participant 1)
"We made a study group scheduled every day to practice" (participant 2)
 "...made small notes about the steps..." (participant 3)
  "...learn with the PIC of the room, there are also SIMRS officers who go around to guide us and if we get stuck" (participant 7).
 "Looking at manuals, making notes or video tutorials..." (participant 8)
 "Instilling positive thoughts, we can definitely use the system" (participant 10).

Subtheme 2: Self-Confidence in Operationalizing Computers

Self-confidence in operating computers by nurses as users. Nurses believe that they can operate computers without requiring special skills. However, it requires the process, intention, and willingness of each individual, self-motivation, efforts in increasing knowledge, and seeing experiences from other hospitals that have implemented EMR.

"I believe, in the beginning, everyone was confused because most nurses rarely hold a computer. No special computer skills are needed..." (participant 1)
"It takes process, intention, willingness, self-motivation, increasing knowledge, age matters" (participant 6).
"Other hospitals have been implemented for a long time..." (participant 8)

The second step for data collection was to consult with two experts from nursing management and information technology experts. The results of the consultation with the two experts were to create a flow / SPO / Technical Guidelines on using electronic medical records and provide recommendations to hospitals to evaluate the use of technology after six months of use and audit the completeness of nursing care documentation.

3.2.Discussion

Perceived usefulness refers to how much people believe that using the system will increase their ability to carry out their work (Aldosari et al., 2018). The results of this study show that nurses have positively perceived usefulness related to electronic documentation. They feel that electronic documentation has a positive impact on their work. Perceived ease of use significantly impacts perceived usefulness and perceived usefulness significantly impacts attitudes and intentions to use the system (Kalayou et al., 2020). The Hospital Management Information System (SIMRS) is very important in integrating all information generated in the service process (Marthen et al., 2022). This computerized nursing care documentation can provide convenience and positive contributions to the leadership, especially in making accountability decisions (Balestra, 2017). Electronic medical records in their use must be tailored to the needs of users in order to assist management in hospital planning in overcoming problems that occur (Ologeanu-Taddei et al., 2015).

Digital-based nursing care documentation can be evidence of nurse performance so that nursing managers can assess whether the care provided by individual nurses is professional, safe, and competent (Balestra, 2017). The design of 3S nursing care documentation in SIMRS, which is more systematic and structured, will be able to provide satisfaction to nurses in documenting their performance in the form of nursing care to patients in healthcare facilities such as hospitals (Marthen et al., 2022). Improving the performance of Hospital Information Systems is an important factor in improving the quality of care and patient safety (Atasoy et al., 2019).

Confidentiality, security, and privacy are major concerns regarding EMR systems (Alanazi et al., 2015; Keshta & Odeh, 2021; Kruse et al., 2017; Tertulino et al., 2023). Security is one of the factors that have a positive effect on EMR perceived usefulness, besides other factors: compatibility and accuracy. Security in information systems has three basic requirements, namely confidentiality (ensuring that data will not be deleted or altered by authorized users), integrity, and availability (including scalability, resilience, and data recovery if data is lost) (Dehling & Sunyaev 2014). Nurses reported steps taken to maintain the security and confidentiality of the system include: not lending passwords and usernames to other health workers, regularly changing usernames and passwords, logging out of the device when not in use, identifying the device used, data encryption with storage in the cloud, limiting access rights. Previous research shows data encryption, chief information security officers (CISOs), cloud computing, use of antivirus software, and controlling access to the system are some of the techniques used to maintain data confidentiality (Keshta & Odeh, 2021; Kruse et al., 2017).

It has been found that using electronic medical records in nursing care can reduce nurses' workload related to documentation so that nurses have more time to spend with patients. In contrast to these results, Jedwab et al. (2022a) found that electronic documentation made nurses feel less interaction with patients, changes in work and interpersonal relationships led to a decrease in nurses' job satisfaction, including less critical thinking skills because they were used to relying on the system (Jedwab et al., 2022a). Electronic documentation also has a negative impact on nurses' psychology (Jedwab et al., 2022b). Fatigue and stress can arise because they must learn to use a new system, which adds to their workload. This is often the case for older nurses (>50 years old) who are not familiar with the use of technology. In addition to reducing workload, nurses in this study reported other benefits of using electronic documentation, namely related to the costs, benefits, and value of the hospital; work gets done faster; reduces human errors; can be used for performance evaluation; documentation can be done anywhere and anytime by people who have access; data for reporting is available faster and can be analyzed immediately, facilitating communication so that treatment decisions are also faster.

The obstacles experienced by nurses in using electronic documentation are problems with the system, including difficulties in accessing the system (poor internet connection, EMR system down, takes a long time to open medical records), which have an impact on services in the form of delays in

work, not ready to face system changes, limited resources, imperfect system integration, non-compliance of nurses in documenting nursing care in electronic medical records. The results of this study are in line with the results of several previous studies, which show that limited resources and time, non-optimal procedures, limited access to information, and inadequate training/technical support are obstacles to using electronic documentation (Arikan et al., 2021; Gesulga et al., 2017; Mahalli, 2015; Murphy et al., 2019; Tsai et al., 2020). Human resources (user resistance and lack of skills) and process resources (concerns about return on investment and lack of administrative and political support) are key barriers to overcome (Gesulga et al., 2017). Lack of skilled human resources and interaction between team members are barriers to EMR implementation in developing countries (Afrizal et al., 2019; Muinga et al., 2020). Meanwhile, Jawhari et al. (2016) reported that there are three main barriers related to EMR implementation, namely system problems (network, hardware, power, interoperability), software (data integrity, functionality, and confidentiality), social factors (management, use of incentives and training).

Related to perceived ease of use, nurses in this study have a positive EMR perceived ease of use. They consider that frequent exposure to EMR makes them more skilled and easy to use EMR. This result is from previous studies showing that experience using EMR and computer skills affect perceived ease of use (Tubaishat, 2018). Perceived usefulness and perceived ease of use affect the attitude of using medical records (Aldosari et al., 2018). EMR adoption is significantly influenced by several factors, including perceived ease of use, perceived usefulness, technological context, organizational context, and environmental context (Abdekhoda et al., 2019).

Computer Self Efficacy indirectly strongly influences behavioral intention to use technology (Chow et al., 2013). Individual behavioral intentions related to EMR have also been shown to positively affect the use of EMR systems (Almarzouqi et al., 2022; Supriyati & Cholil, 2017). Self-efficacy can predict how much effort can be done and how long individuals can survive difficult and obstacles. This study's nurses believe they can operate computers without requiring special skills. However, it requires a process, intention, and willingness of each individual, self-motivation, and efforts to increase knowledge.

Various adaptation efforts are taken by nurses so that they are familiar with the electronic documentation system, including learning to use the system, forming learning groups scheduled every day, practicing with room PICs and SIMRS officers, opening guides, and viewing tutorial videos. When nurses learn to use the system daily, their self-efficacy will also increase. Self-efficacy is a factor that significantly affects perceived ease of use (Cho et al., 2021; Zaman et al., 2021). Nurses with higher self-efficacy in using electronic documentation systems are more likely to believe that the system is easy to use (Zaman et al., 2021). This suggests that the implementation of the system should be designed simply and consistently so that nurses can easily find and document patients' electronic records when they have to use them daily. Self-efficacy in using electronic documentation is important because it can minimize the risk of errors, provide services effectively and efficiently, increase work motivation and organizational commitment, and increase nurses' satisfaction as users (Tubaishat, 2018).

4. Conclusion

The Technology Acceptance Model can measure the acceptance of electronic medical record technology in hospitals for the largest users, namely nursing staff. Nurses have positively perceived the usefulness and perceived ease of use using EMR. Nurses perceive the benefits and ease of use of EMR. The main constructs of TAM, PU, and PEOU show a positive correlation, and CSE is also positively correlated with PEOU. Adaptation by familiarizing nurses with the electronic documentation system to make them familiar and improve their computing skills will maximize their perception of this technology. Issues related to security and privacy should be a major concern, and obstacles in

operationalizing the system should be anticipated. Therefore, clear and detailed guidelines and procedures for implementing 3S nursing care in EMR are needed.

Acknowledgments

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