

EFFECT OF NURSING INFORMATICS TRAINING PROGRAM ON NURSES INTERNS' KNOWLEDGE AND SKILLS

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Abstract

Background: Nursing informatic is a crucial field in healthcare that require specialized training and follow up to adequately develop the knowledge and skills required by nurses to utilize health information technology. **Aim:** To examine the effect of nursing informatics training program on nurse interns' knowledge and skills. **Design:** A quasi-experimental design was utilized in this study. **Setting:** The study was conducted at Faculty of Nursing at Cairo University. **Subjects:** a convenient sample of nurse interns (n=30) who trained in critical care area. **Tools:** Two tools were utilized 1- nursing informatics knowledge questionnaire (50 items) 2- electronic medical record auditing checklist (25 items). **Results:** The study revealed that there were a significant statistical differences in total knowledge test scores and knowledge dimensions during different periods of assessment. The total mean score across all dimensions increased significantly from $\bar{x}=25.70$ pre-program to $\bar{x}=37.47$ post-program and $\bar{x}=33.97$ at follow-up. Additionally, there were a statistical significant differences in total mean scores of nurse interns nursing informatics skills, with the overall total mean score increased from ($\bar{x}=17.23$) post-program to ($\bar{x}=19.86$) at follow-up. **Conclusion:** The current study found a significant improvement in nurse interns nursing informatics knowledge test scores, and informatics skills immediately and three months after program implementation. **Recommendations:** Academic institutions should incorporate comprehensive nursing informatics curricula into their nursing education programs, Healthcare administrators should provide ongoing nursing informatics education and training to nursing staff at regular intervals.

Keywords: Knowledge, Nursing Informatic, Nurse Interns, Skills.

INTRODUCTION

Nurses play a crucial role in providing essential medical care to patients in healthcare settings worldwide. Their responsibilities extend beyond administering treatments to encompass comforting and communicating with patients to alleviate anxiety and enhance their overall hospital experience. Leveraging advanced technological tools significantly aids nurses in fulfilling their duties with greater efficiency and accuracy (Forman et al., 2019). These technological innovations streamline workflows, facilitate access to patient information, and support evidence-based decision-making, ultimately contributing to the delivery of high-quality and patient-centered care (Jouparinejad et al., 2020).

Nursing is the largest workforce in health care and nurses are increasingly required to work with digital information systems. The need for nurses to understand and embrace information technology is closely linked with the ability to function in the contemporary healthcare workplace (Amanuail et al., 2021).

Recently, many healthcare organizations recognize the importance of robust health information systems in improving decision-making and ultimately achieving better health outcomes. These systems significantly impact healthcare quality, efficiency, and technological advancement, offering advanced opportunities to bolster industry support. Health information technology (HIT) involves using computer hardware and software to process information, store, retrieve, share, and apply healthcare knowledge and information (Harerimana & Mtshali, 2019).

Nursing informatics (NI) has emerged as a specialized field within the realm of health information technology (HIT), merging principles from nursing science, computer science, and information science. Its primary objective is to efficiently manage and disseminate data, information, and knowledge within the nursing practice landscape. By seamlessly integrating these disciplines, NI significantly enhances the quality of healthcare delivery and raises the standards of nursing practice to new heights (Strudwick et al., 2019).

The integration of nursing informatics into healthcare systems is currently a central focus, carrying substantial implications for transformative change within the health industry. Nursing informatics holds promise in meeting the information requirements of populations and public health, while also playing a role in shaping government health policies and financing. Moreover, it offers consistent opportunities for improving communication, care quality, efficiency, patient outcomes, and safety in both medical and nursing practices. By minimizing errors and streamlining processes, nursing informatics ultimately leads to cost reductions in healthcare delivery (Priestman et al., 2018).

Nursing informatics encompasses various components essential for effective healthcare delivery in the digital age. One crucial component is data management, involving the collection, storage, and retrieval of patient information in electronic health records (EHRs) (Rumball-Smith et al., 2018). Another key aspect is information technology infrastructure, which includes hardware, software, networks, and databases supporting healthcare operations. Clinical decision support systems (CDSS) are integral components aiding healthcare professionals in making evidence-based decisions by providing relevant patient data and treatment recommendations (Mohamed & Abouzaied, 2021). Additionally, interoperability standards ensure seamless communication and data exchange among different healthcare systems and organizations, facilitating coordinated patient care. Education and training programs equip nurses with the necessary skills to navigate and utilize informatics tools effectively, promoting patient safety and quality of care. These components collectively empower nurses to leverage technology in optimizing healthcare delivery and improving patient outcomes (Kaihlainen et al., 2023).

There is a significant number of today's nursing practitioners who do not have an innate familiarity with nursing informatics and did not grow up in an environment where information technology was widespread. This is despite the fact that nursing informatics offers a multitude of benefits. In addition, it is predicted that forty-five percent of the current nursing workforce does not have adequate training in computer abilities, as well as in nursing knowledge and skills that are related to nursing informatics. This weakness has been noted as a serious worry that has an impact on the safety of patient care, the comfort of nurses in the utilization of clinical documentation systems, and the outcomes for patients (Almarwani & Yacoub, 2023).

Nursing informatics plays a crucial role in equipping nurse interns with the essential knowledge and skills needed to thrive in modern healthcare settings. As technology continues to advance, nurses must be adept at utilizing health information technology (HIT) systems and electronic health records (EHRs) to provide optimal patient care. Nursing informatics training programs provide nurse interns with a comprehensive understanding of how to effectively manage and disseminate healthcare data, ensuring accurate documentation and informed decision-making. Moreover, these programs empower nurse interns to leverage technology to streamline workflows, improve care coordination, and enhance patient outcomes. By integrating nursing informatics principles into their practice, nurse interns can deliver evidence-based care, contribute to interdisciplinary collaboration, and adapt to the ever-changing landscape of healthcare technology (Forman et al., 2019).

Significance

In the era of advancing information technology, health sectors globally are rapidly adopting health information technology to enhance patient care and service quality. This transition includes implementing electronic medical records (EMRs) to improve efficiency, safety, and care coordination while maintaining patient privacy. In Egypt, government initiatives have introduced IT into healthcare, yet challenges persist, such as nurses' lack of basic computer skills, particularly among new graduates. Also, current nurses lack training in nursing informatics, hindering technology adoption, especially in critical care settings. Addressing this, the study aims to assess the impact of a nursing informatics training program on nurse interns' knowledge and skills, particularly in intensive care units, aiming to foster technology adoption and improve patient care outcomes.

Aim of the study

The current study aimed to examine the effect of nursing informatics training program on nurse interns' knowledge and skills.

Research hypothesis

- H1: There will be an increase in the mean test score of nursing informatics knowledge of nurse interns' after the program implementation comparing to before.
- H2: There will be an increase in the mean score of nursing informatics skills of nurse interns' after the program implementation.

Research Design

A quasi-experimental (one group pretest/posttest) design was utilized in this study.

Setting:

The current study was conducted in the Faculty of Nursing at Cairo University through the utilization of an open-access electronic medical record system called OpenEMR system.

Sample:

A convenient sample of 30 nurse interns who were scheduled to undergo their internship training program in the critical care area at Elkasr Al-Ainin Hospital, Cairo University, during the academic year 2021–2022.

Data collection tools:

Two tools were utilized as follows:

First tool: nursing informatics knowledge questionnaire

The researcher developed it after an extensive review of the literature, and it was divided into two parts as follows:

1st Part: Personal Characteristics Data Sheet:

It was developed by the researcher and include (age, gender, attendance of previous courses about nursing informatics or computer science, and their experience regarding computer).

2nd part: Nursing informatics knowledge questionnaire:

The questionnaire was used to assess nurse interns' knowledge regarding nursing informatics. It consisted of 50 questions (40 multiple-choice questions and 10 true/false questions) divided into seven dimensions..

Scoring system:

Each question was assigned one point for the correct answer and zero for the incorrect answer. The total score for all questions was 50.

Second tool: Electronic medical record Auditing checklist:

This tool was developed by the researcher based on a review of related literature to assess the proficiency of nurse interns in utilizing the electronic medical record system. It consisted of 25 items divided into four dimensions including Electronic vital signs chart (7 items), Electronic fluid balance chart (6 items), Electronic medication administration chart (6 items), and Electronic nursing documentation (6 items).

Scoring system

Each item was assigned one point for 'completely done' and zero points for 'not done.' The total score for all items was 25.

Tools Validity

Content validity was checked by a panel of five experts from the nursing administration department at the Faculty of Nursing of Cairo University. The content, coverage, clarity, wording, length, format and the overall appearance of the tools were checked.

Tool reliability

Cronbach's Alpha test was done for the study tools. As regards nursing informatics knowledge questionnaire, the calculated reliability test score was (0.82) within the acceptable limit. The calculated reliability was (0.79) for the electronic medical record Auditing checklist, indicating excellent internal consistency..

Ethical Consideration:

Official permission was granted from the Ethical Research Committee at the Faculty of Nursing, Cairo University to conduct the current study. Additionally, formal approval was obtained from the OpenEMR Foundation to utilize their system for research purposes.

The procedure

Assessment phase:

In this phase, the researcher developed the study tools based on an extensive literature review, ensuring tool validity and reliability. Additionally, a list of nurse interns, their numbers, and distribution in the clinical area was prepared. The researcher explained the aim, nature, and significance of the study to the nurse interns to obtain their acceptance to participate. Written acceptance from the nurse interns was obtained.

Planning phase:

Prior to the nursing informatic training program implementation, an initial assessment of the nurse intern's knowledge of nursing informatics was measured by using the nursing informatics knowledge questionnaire. The time spent by each nurse intern to answer the nursing informatics knowledge questionnaire was 30-40 minutes. The results obtained from the initial assessment of the nursing informatics knowledge questionnaire were analyzed, and educational needs were identified. Based on this initial assessment, the researcher designed the program, which was subsequently reviewed for validation by experts from the Nursing Administration Department at the Faculty of Nursing, Cairo University, and the program schedule was arranged accordingly.

Implementation phase:

After the program development by the researcher and participants were contacted via WhatsApp. The program schedule was issued and participants were contacted via WhatsApp. The first session was conducted online using ZOOM, with the researcher explaining the study's aim and obtaining consent. The program content was explained over ten sessions, with eight sessions dedicated to the theoretical part and two sessions for the practical part. Each session lasted two hours. The total program spanned one month, starting from the beginning of April 2022 and continuing until the end of the month.

The program focused on nursing informatics for nurse interns, providing skills in data management, patient safety, workflow optimization, technology integration, collaboration, evidence-based practice, and continuous learning. The program sessions were structured to provide theoretical knowledge and encourage interactive discussions, bridging the gap between theory and practice, and contributing to the growth of informatics nurse specialists.

Evaluation and follow-up phase:

In this phase, the researcher evaluated the impact of training program immediately after its completion and conducted a follow-up assessment after six months using the same tools.

RESULTS

Table 1: Frequency distribution of nurse interns according to personal characteristics (n=30).

Socio-demographic Characteristics	No.	%
Gender:		
Male	13	43.3
Female	17	56.7
Age:		
< 23 years	30	100
Attending previous nursing informatics training program:		
Yes	0	0
No	30	100
Attending previous computer science training program:		
Yes	12	40
No	18	60
Course name		
ICDL	8	8.9
Excel course	1	1.1
PowerPoint Basic presentation course	2	2.2
worked or received training in any type of electronic medical record:		
Yes	0	0
No	30	100

*P value is significant at ≤ 0.05 .

Table (1) reveals that the majority of the study sample were females (56.7%), with the remainder being male (43.3%), all aged below 23 years. None of the participants had attended nursing informatics training programs, while 60% had not received any computer science training, and the remaining 40% had undergone various computer science training programs. Additionally, none of the participants had experience working with or received training in any electronic medical record systems.

Table 2: Distribution of nurse interns regrading total nursing informatics knowledge levels during different period of assessment (pre, immediately post program and three months later) (n=30)

Total nursing informatics knowledge levels	Pre-program		Immediately post program		Three months later		Chi square	
	No.	%	No.	%	No.	%	χ^2	p-value
Low (<60%)	27	90	1	3.3	1	3.3	87.32	.00*
Moderate (60%- <75%)	3	10	15	50	27	90		
High ($\geq 75\%$)	0	0	14	46.7	2	6.7		

*P value is significant at ≤ 0.05 .

Table (2) showed that there was highly statistically significant difference was observed in total knowledge scores ($x=87.32$, $p=0.00$) between these periods. Initially, 90% of nurse interns scored low knowledge (<60%), but this decreased to 3.3% immediately post-program and remained at 3.3% three months later. Conversely, 10% of nurse interns had moderate knowledge (60%- <75%) pre-program, increasing to 50% immediately post-program and 90% three months later. Initially, 46.7% of nurse interns had high knowledge ($\geq 75\%$), which decreased to 6.7% three months later.

Table 3: comparison of the mean scores of nursing informatics knowledge test score of nurse interns during different periods of assessment (pre, immediately post program and three months later) (n=30)

Nursing informatics knowledge dimensions	Pre-program		Immediately post program		Three months later		F-test	P-value
	Mean	SD	Mean	SD	Mean	SD		
Definition and application of nursing informatics	2.93	1.23	4.40	0.86	3.77	1.28	12.56	.00 *
Types and component of computer	3.77	1.30	5.30	1.18	4.87	1.11	13.03	.00 *
History and foundations of Nursing Informatics	3.63	1.22	6.10	1.18	5.27	1.31	30.77	.00 *
Legal and Ethical Considerations in Nursing Informatics	2.73	1.17	3.60	1.16	3.67	0.96	6.69	.00 *
Electronic Medical Record	4.00	1.17	5.43	1.01	4.87	1.55	9.80	.00 *
Clinical Decision Support Systems and Electronic Medication Management Systems	4.53	1.20	6.73	1.60	6.03	1.52	18.09	.00 *
Computerized Physician Order Entry Systems	4.10	1.27	5.90	1.18	5.50	1.43	15.87	.00 *
Total (Mean \pm SD)	25.70	8.56	37.47	8.17	33.97	9.15	107.70	.00 *

*P value is significant at ≤ 0.05 .

Table (3) illustrates statistically significant increase in nurse interns' knowledge test scores on nursing informatics dimensions immediately after the program, with a slight decrease observed three months later compared to pre-program levels, as reflected in the total mean scores (25.70 ± 8.56 , 37.47 ± 8.17 , 33.97 ± 9.15), ($F=107.70$, $P=0.00$).

Specifically, the dimensions of Clinical Decision Support Systems and Electronic Medication Management Systems showed improvement immediately post-program (6.73 ± 1.60) and three months later (6.03 ± 1.52) compared to pre-program levels (4.53 ± 1.20), ($F=18.09$, $P=0.00$).

Table 4: comparison of the mean scores of different dimensions of nurse interns' electronic medical record skills during different period of assessment (pre immediately post program and three months later) (n=30)

Electronic medical record skills dimensions	Immediately post program		Three months later		F-test	P-value
	Mean	SD	Mean	SD		
Electronic vital signs chart	5.00	1.62	5.80	0.96	2.64	.00*
Electronic fluid balance chart	3.74	1.48	4.80	0.85	3.94	.00*
Electronic medication administration chart	4.14	1.48	4.56	0.81	1.58	.00*
Electronic nursing documentation sheet	4.34	1.42	4.70	0.89	1.32	.01*
Total (Mean \pm SD)	17.23	6.00	19.86	3.52	4.51	.00*

*P value is significant at ≤ 0.05 .

Table (4) showed that there was a highly statistically significant differences in nurse interns' skills mean scores regarding electronic medical record skills dimensions three months post program implementation compared to immediately post program implementation in all dimensions which was reflected in total mean scores respectively (17.23 ± 6.00 , 19.86 ± 3.52), ($F=4.51$, $P=0.00$).

The same table showed that (electronic vital signs chart) dimension had improved three months post program implementation (5.80 ± 0.96) compared to immediately post program implementation (5.00 ± 1.62) ($F=2.64$, $P=0.00$).

Table 5: Correlation between nurse interns' nursing informatics knowledge and electronic medical record skills after program implantation during times of assessment (immediately post program and tree months later) (n=30)

Nurse interns' total nursing informatics knowledge	Nurse interns' total electronic medical record skills	
	r	p
Immediately post program	.30	.04*
Three months later	.06	.03*

*P value is significant at ≤ 0.05 .

Table (5) showed that there was statistically significant positive correlation between nurse interns' nursing informatics knowledge and their electronic medical record skills immediately post program and three months post program implementation respectively ($r=0.30$, $P=0.04$), ($r=0.06$, $P=0.03$).

DISCUSSION

Regarding the total knowledge level of nursing informatics among nurse interns, the current findings revealed that there were a highly statistically significant differences in nurse interns' test scores regarding nursing informatics knowledge dimensions during different assessment periods. They exhibited the highest mean scores immediately after program implementation and three months later compared to before program implementation. It is noteworthy that the majority of nurse interns scored low before the program.

However, there was a marked improvement in knowledge immediately after the program, with half of the participants scoring moderate knowledge and the other half scoring high knowledge. This improvement was sustained three months later, with 90% of the participants scoring moderate knowledge or higher.

From the researcher's point of view, the significant increase in knowledge levels can be attributed to the fact that the majority of the nurse interns participating in the study had limited exposure to nursing informatics prior to the program. Nursing informatics is a relatively new field, and it is not yet integrated into all nursing curricula.

The nurse interns wanted to know all the information about it. Additionally, the nurse interns may have come from a variety of educational backgrounds, and some of them may not have had any prior experience with technology. Additionally, nursing informatics helps nursing staff improve their documentation, data management, and decision-making processes.

The results of the study was in agreement with Hassona & Ali, (2019)highlighted in their study that the intervention resulted in a substantial increase in nursing informatics knowledge among participants, with their competency level transitioning from 'competent' in the pre-testing phase to 'proficient' following the training program. Similarly, Eldoushy & Behairy (2023) who found that the post-intervention information knowledge and skills grade of the control group improved following the implementation of the program..

Regarding nursing informatics knowledge test score of nurse interns, the study found a significant increase in nursing informatics knowledge test scores immediately after the program implementation, which slightly declined three months later compared to the pre-program assessment. From the researcher's point of view, the decline in nurse interns' informatics skills post-program suggests a need for further training in academic and workplace settings.

Enhancing informatics competency requires expanded academic courses covering computer skills, informatics, evidence-based practice, and nursing administration, particularly focusing on intern nurses. Additionally, continuous education opportunities from academic institutions or healthcare facilities could support ongoing skill development.

The results of the study was in agreement with Samadbeik et al., (2020), who revealed that after implementing the nursing informatics training program, nursing practitioners gained more knowledge and experience. Similarly, VanLangen et al., (2020), and Fennelly et al., (2020) highlighted the significance of academic electronic health records (EHRs) in nursing courses. Exposure to such technology during professional education enables students to develop the health informatics knowledge, talents, and skills necessary for successful practice in healthcare.

As regard to total mean scores of nurse interns electronic medical record skills, the current study result revealed that there were a highly statistically significant differences in nurse interns' skills mean scores regarding electronic medical record skills dimensions three months post-program implementation compared to immediately post-program implementation in all dimensions.

From the researcher point of view, this improvement in nurse interns' electronic medical record skills three months after the program implementation, compared to immediately after, may be attributed to several factors. The trimester duration allows interns more practice opportunities during simulation sessions, fostering skill development. Increased practice and feedback contribute to greater confidence in using the EMR system, leading to enhanced effectiveness and accuracy in documentation and data entry. With time, interns are likely to establish routines and strategies for seamlessly integrating EMR tasks into their workflow.

The results of the current study are consistent with Mollart et al. (2023), who reported that the utilization of an educational electronic medical record (EMR) simulation training program resulted in an improvement in participants' skills in using electronic medical records.

Additionally, there was a notable enhancement in their knowledge and skills related to nursing informatics. In the same line, Zavodnick & Kouvatsos (2019) who found that there was a positive responses from senior nursing students after conducted workshop aimed at improving the electronic medical record skills and led to enhanced confidence in different facets of electronic medical record skills, including data collection, documentation, and managing unsolicited information, as well as order entry. Contrary to the current study's findings, a study by Özer et al., (2020), that revealed unfavorable attitudes towards the electronic medical record (EMR) system.

Regarding the correlation between nurse interns' nursing informatics knowledge and electronic medical record skills after program implantation, the results of the current study showed that there was a positive correlation between nurse interns' knowledge of nursing informatics and their electronic medical record (EMR) skills immediately and three months post program implementation.

From the researcher point of view, the correlation strength weakens over time. It might be due to decreased skill sharpness due to infrequent practice, external factors like workload or stress, and limited access to EMR systems.

This finding was supported by Hong et al. (2022) research. Their study incorporating academic electronic medical records (AEMR) into simulation education scenarios, found satisfied with the simulation education incorporating AEMRs and recognized their confidence in academic electronic medical records (AEMR) utilization. And the results demonstrated the positive relationship between nursing informatics knowledge and electronic medical record skills.

On the same line, Choi et al. (2018) conducted a study to assess the effects of academic electronic medical records training for undergraduate nursing students. They discovered significant increase in the informatics knowledge domain of nursing informatics competencies in the post-test. Which in turn has a significant positive effect on EMR skills.

CONCLUSION

The finding of the present study concluded that there was statistically significant difference in knowledge test scores with marked improvement of nurse interns about nursing informatics after the program implementation and three months later compared to pre-program.

Additionally, there was statistically significant difference in mean scores with marked improvement of nurse interns nursing informatics skills after the program implementation and three months later.

Recommendation:

- Healthcare organizations should prioritize the integration of nursing informatics training programs into their professional development initiatives for nurse interns.
- Implement the nursing informatics training program in healthcare organizations to equip nurse interns with essential informatics competencies and enhance their ability to effectively use electronic health records and other health IT systems.
- Provide ongoing informatics education and training to nursing staff at regular intervals to facilitate continuous skill development and keep them updated on emerging technologies.
- Nursing schools and academic institutions should incorporate comprehensive nursing informatics curricula into their nursing education programs to ensure that nurse interns are equipped with the necessary knowledge and skills to navigate the digital healthcare landscape.
- Conduct longitudinal studies to assess the long-term impact of nursing informatics training programs on nurse interns' career paths, job satisfaction, and professional development.

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