Designing and Implementing Electronic Health Records Software for Intern-Nurses by Using Advanced Mobile Devices

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Abstract

Background Technology is increasing the complexity in the role of today's nurse. Healthcare organizations are integrating more health information technologies and relying on the electronic health record (EHR) for data collection, communication, and decision making. Nursing faculty need to prepare graduates for this environment and incorporate an EHR into a nursing curriculum. Although the need exists for student preparation, some nursing programs are struggling with implementation. ***Aim:*** Designing and implementing EHRs software for intern-nurses by using advanced mobile devices. ***Design****:* A quasi-experimental design was utilized. ***Setting:*** This study was conducted in different units in medical and surgical clinical departments at Benha University Hospital. ***Subjects****:* were composed of representative simple random sample consisted of ٢٥٪ of intern-nurses (٦٠ intern-nurses) of Benha Faculty of Nursing. ***Tools:*** data of the present study was collected by using three tools; First tool: Intern-Nurses' Knowledge Questionnaire, Second tool: Intern-Nurses' Technological Skills (Observational checklist) and Third tool: Intern-Nurses' Attitude Questionnaire***. Result:*** the result revealed that the highest percent of intern-nurses (٩٠٪) had adequate knowledge scores about EHRs at immediately post-program implementation phase , the majority of them had high technological skills level required for using EHRs, and positive attitude toward EHRs at follow up and immediately post-program from the preprogram implementation phases (٨٣.٣٪ ,٧٦.٦٪, ٨٦.٧٪ & ٨٥.٠٪) respectively. ***Conclusion****:* the study concluded that there was highly statistically significant positive correlation among intern-nurses knowledge regarding EHRs software with their technological skills and attitude toward EHRs software at pre- program, immediate post and follow up program implementation phases. ***Recommendation:*** The study recommended that; the hospital administration should take the necessary steps to develop proper information communication technology infrastructure required for EHRs records utilization with AMDs in clinical practice and gradual introduction of an EHR software system in the general hospital.

Key words: Advanced mobile devices (AMDs) - Electronic health records (EHRs)- Intern-nurses performance.

Introduction

Technology has continued to change health care since the stethoscope was invented in ١٨١٦. As with contemporary technology, the device didn't replace the work of clinicians, but rather enhanced and expanded their capabilities. Digital thermometers, advanced wound care supplies, ECGs, and electric patient lifts are just a few of the technologies that have enhanced and expanded clinical practice. As the healthcare industry faces the challenges of skyrocketing costs, decreasing reimbursement, nursing shortages, and increased patient acuity. So the technology may help to meet patients' needs and optimize the work ***(Rashed, ٢٠١٨).***

Healthcare delivery largely depends on information for effective decision making. Every nursing action relies on knowledge based on information. As the nursing process begins with obtaining the information and communicating it in the initial and ongoing assessment. So nursing informatics (NI) is the man-augment of data, information, knowledge and wisdom relevant to nursing. As we enter the era of the electronic health record (EHR), NI has become indispensable element in the nursing practice ***(Cathy, ٢٠١٤).***

Documentation is one of the most crucial aspects of nursing care, as reflected in the old nursing adage, "If it wasn't charted, it wasn't done". Nurses in an acute care medical surgical unit spend approximately ١٤٧ minutes charting in a typical ١٠-hour shift. The EHR is where this important collection of data, information, knowledge and eventually wisdom resides. Nursing education, however, has not kept pace with the need for nursing students to learn how to use this valuable tool. Nursing students have limited access to EHRs in prelicensure programs. Nurse faculty and nursing students' attitudes and perception toward health information technology in nursing education have been studied, yet concrete descriptions and procedures for implementing technology are lacking ***(Jenkins et al., ٢٠١٨).***

The concept of mobile electronic medical record (MEMR) systems: is expected to be one of the superior approaches for improving nurses' bedside and point of care services. EHR: health record of an individual that is accessible online from many separate, interoperable automated systems within an electronic network. EHR: an electronic method of storing, manipulating and communicating medical information of all kinds including text, images, sound, video and tactile senses, which are more flexible than paper-based systems. Often referred to as a medical record, it

contains a client's (patient) entire medical history and information crucial to future care. Electronic documentation: a document existing in an electronic form to be accessed by computer and any type of mobile information technology ***((Elliott et al., ٢٠١٨; De Groot et al., ٢٠٢٠)***.

The EMR is a longitudinal and real-time electronic record of patient medical information generated, gathered, managed and consulted by authorized clinicians and staff within any care delivery setting. A number of terms are associated with these records including EHR, EP, and CMR, among others. These terms are often used interchangeably. National Alliance for Health Information Technology adopted the definition of an EMR: "an electronic record of health related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff within one health care organization" , even if it was used interchangeably with term 'EHR' ***(Ring, & Tierney, ٢٠١٧)***.

Mobile technology are portable and are updated frequently, as compared to textbooks which become obsolete quickly has the potential to enhance nursing practice through nurses being able to find or check information about illness, disease or injury, view or revise procedures or care to be undertaken, or ensure correct medications are administered to patients without needing to go to the nurses' station, treatment room or locate a computer terminal to retrieve information ***O'Connor, et al., ٢٠٢٠)***.

In some nursing programs, students are not exposed to electronic documentation until they participate in clinical rotations in local hospitals**.** Unfortunately, during clinical rotations, it is not easy for students to learn about best practices in electronic documentation. However, students can learn to navigate EHRs in simulation labs. It has reported partnering with a medical center to provide students access to training with EHRs before the first clinical rotation. These students felt more confident with their documentation. In addition to educating students in a transitional electronic environment is no longer optional for Nursing Faculty. It is necessary for accurate documentation, transmission, and management of data for improving patient care ***(Chung & Cho, ٢٠١٧)***.

The wide adoption of EHR systems has led the Institute of Medicine (IOM) to emphasize the use of informatics as a core competency required of all health care professions. The ٢٠٠٩ Health Information Technology for Economic and Clinical Health Act (HITECH) directs all health providers to use EHRs. The National League for Nursing (NLN) recommends that Nursing Faculty should incorporate informatics into all levels of the curriculum. However, the nursing profession has been slow to incorporate information technology into formal nurse education and practice ***(O'Connor & LaRue, ٢٠٢١)***.

Additionally, EHR also incorporates new features, help nurse's practice better nursing care, supporting standard nursing terminology, incorporating clinical documentation from various sources, supporting standard care plans, guidelines, and protocols, supporting drug interaction checking, presenting alerts for preventive services and wellness, and linking clinical tasks. These features may alter how nurses document, make decisions, and communicate with other healthcare providers ***(Kim et al., ٢٠١٧)***.

With EHRs health care team members are able to capture patient information of different disciplines, and share the information to promote better patient care management and outcomes, eliminate unnecessary and duplicate tests, and to reduce medical errors. Various studies have shown that using EHRs has improved patient safety, increased the quality of care, and reduced health care costs. In addition, the data in EHRs is considered a significant resource for clinical evidence that has been used for evidence based practice research in multidiscipline. However, several studies suggested that poor understanding of EHR's functionality may lead to medical errors ***(Jedwab et al., ٢٠١٩; Samadbeiket al., ٢٠٢٠)***

With EHRs, the transfer of complete records from provider to provider or facility to facility happens electronically. That also means records don't get lost or delayed when patients change providers or providers make referrals Therefore, healthcare professionals need to be trained to be knowledgeable and have a true understanding of the use of EHRs to prevent medical errors and improve the quality of patient care ***(Kowitlawakul, et al., ٢٠١٣; Mollart, et al., ٢٠٢٠)***.

Computerized medical record systems, commonly referred to as EHR or EMR, and were introduced in clinical settings in the early ١٩٦٠s. Since then, the adoption rate of EMR systems has continuously increased. While EHRs have been widespread, the nursing education curriculum is faced with challenges related to EHR use in clinical practicum. One of the possible reasons is that computers are either accessible only at fixed sites or restricted due to the volume of users and there are other barriers described physical barriers, such as a lack of space and the lack of EMR workstations for students at practicum sites. Another barrier was that students have access

to the EMR computer without appropriate permissions to input information because of practical and liability issue ***(Whitt, et al., ٢٠١٧; Choi et al., ٢٠١٨)***.

Moreover various studies showed that new technologies, such as ubiquitous mobile devices and health information technology systems, used at hospitals and outpatient clinics can be integrated into clinical practicum curricula. Most nurses and nursing undergraduates regarded mobile devices as useful in accessing necessary information, making notes, saving time, and increasing self-confidence, as well as in improving patient safety and quality of care (***O'Connor, ٢٠١٨).***

Aim of the study

Designing and implementing electronic health records software for intern-nurses by using advanced mobile devices.

Research objectives

١-Design, validate and implement electronic health records software for intern-nurses by using advanced mobile devices.

٢-Assess intern-nurses' knowledge about electronic health records software by using advanced mobile devices thorough program.

٣-Assess intern-nurses' technological skills for using electronic health records software by using advanced mobile devices through :

a) -Identifying intern-nurses' technological skills for using electronic health records software by using advanced mobile devices thorough program.

b) - Measuring intern-nurses' actual performance toward electronic health records software by using advanced mobile devices during and after implementing the program (Data entry).

٤-Determine intern-nurses' attitude toward electronic health records software by using advanced mobile devices thorough program.

Research Hypotheses

It is hypothesized that designing and implementing electronic health records software for intern-nurses by using advanced mobile devices will lead to significant improvement of intern-nurses' knowledge, technological skills, performance and attitude toward electronic health records software by using advanced mobile devices

Subject and Method

Research design

A Quasi-experimental design was used to achieve the aim of the present study

Setting

The present study was conducted in different units in medical and surgical clinical departments at Benha University Hospital (Free services hospital) where the intern-nurses were trained

Sample

The subjects who participated in this study were composed of representative simple random sample consisted of ٢٥٪ of intern-nurses of Benha Faculty of Nursing who were enrolled in the internship year ٢٠١٩/ ٢٠٢٠ at Benha University Hospital and having advanced mobile device . The total number of intern-nurses was ٢٤٠ intern-nurses at the time of the study, so the actual number of intern-nurses included in this study was (٦٠) chosen randomly.

Tools for data collection

Tools of data collection

Data of the present study was collected by using the following three tools;

Intern-Nurses' Knowledge Questionnaire:

Self-administered questionnaire was developed by the researcher based on literature review ***(Hassan & Mostafa, ٢٠٠٩; Ajibade, Oladeji, & Okunlade, ٢٠١٣; Dall, ٢٠١٤; Akpabio, & Ella, ٢٠١٥; Pordeli, ٢٠١٧ ;Rashed, ٢٠١٨)*** to assess intern-nurses' knowledge about electronic health records software by using advanced mobile devices it used before, immediately post and follow up three months after implemented of training program. It consisted of two parts as follows:

The first part: It included intern-nurses' personal data and divided into the following ٣ sections:

Section١:It consisted of ١٠ questions about personal characteristics of intern-nurses; (age, gender, marital status, Place of living (residence), Pre-university education, do you have a computer, how would you rate your computer literacy skills, Have Medical Apps installed on your mobile device, do you think hospital employers should establish policy for personal communication devices use ,In general, how do you feel about advanced mobile devices (cell phone, smartphone or tablet computer)).

Section٢:It consisted of ١١ questions about previous AMDs utilization in learning and academic training

Section٣: It consisted of ٧ questions about previous experience and utilization of any type of AMDs or desktop computer.

Table (١) The second part: Self-administered questionnaire. It consisted of (٩٢) questions and divided into ٣ sections distributed as follows

Question type Section content	True or false	Multiple choice	Total
Knowledge about NI	١٣	١٦	٢٩
Knowledge about AMDs	١٣	٩	٢٢
Knowledge about EHRs	٢٢	١٩	٤١
Total	٤٨	٤٤	٩٢

Scoring system

The scoring system for intern-nurses' knowledge was calculated as follows; (١) score for correct answer, and (٠) for incorrect. The score of the items was summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score.

The total knowledge score (٩٢ degrees)

- Adequate knowledge if the percentage score ≥ ٦٠ % (٥٥- ٩٢ degrees)
- Inadequate knowledge if the percentage score is < ٦٠ % (٠ < ٥٥ degrees)

Reliability

This tool was tested for reliability to estimates the consistency of measurement. Reliability was done using Alfa Coefficient test was ٠.٨٦.

II-Intern-Nurses' Technological Skills (Observational checklist):

Observational checklist was developed by the researcher based on scientific literature review ***(Tiger Initiative. ٢٠٠٩; Ghoneimy, ٢٠١٥; Adeleke, Salami & Achinbee, ٢٠١٥; Pordeli, ٢٠١٧; Rashed, ٢٠١٨).*** It included two parts:

The first part: Intern Nurses' Technological Skills Observational Checklist: It include different items to assess intern-nurses' technological skills for using electronic health records software by using advanced mobile devices before, immediately post and follow up after three months implemented of training program. It consisted of "٣١" items that grouped under two categories:

Technological skills required for using EHRs: It covered "٢٥" items such as (use search engine and accessing the internet and etc….).

Informatics literacy and management skills: It covered "٦" items such as (navigate electronic health record and etc….).

Scoring system

The scoring system for Intern nurses' technological skills was calculated according to a three-point likert scale ranges from: not done (٠ point), incompletely done (١ point) and completely done (٢ points). The total score was "٦٢" degree and cut point was done at ٦٠٪ = ٣٧scores. A total score was calculated by summing up the grades of items of checklist, the scores were converted into percent score. The level of practice was determined as the following:

- High level if the percentage score is ≥ ٧٥ % (٧٥٪ (٤٧ - ٦٢ degrees),
- Moderate level if the percentage score equals ٦٠ - < ٧٥ % (from ٣٧ < ٤٧ degrees)
- Low level if the percentage score if the percentage score is < ٦٠ % (٠ < ٣٧degrees)

The second part: Intern-Nurses' Performance Observational Checklist (Data entry): It include different items to measure intern-nurses' actual performance before, immediately post and follow up after three months implemented of training program. It covered ١٤ items such as (using the keyboard and having good typing skill and etc….).

Scoring system

The scoring system for Intern-nurses' performance (Data entry) was calculated according to a three-point likert scale ranges from: not done (٠ point), incompletely done (١ points) and completely done (٢ points). The total score was "٢٨" degree cut point was done at ٦٠٪ = ١٤ scores. A total score was calculated by summing up the grades of items of checklist, the scores were converted into percent score. The level of performance was determined as the following:

- Highly acceptable (High level) level if the percentage score is ≥ ٧٥ %(٧٥٪ (١٨-٢٨ degrees),
- Acceptable (Moderate level) if the percentage score equals ٦٠ - < ٧٥ % (from ١٤ < ١٨ degrees)

- Unacceptable (Low level) if the percentage score if the percentage score is < ٦٠ % (٠ <١٤ degrees)

Reliability

This tool was tested for reliability to estimates the consistency of measurement. Reliability was done using Alfa Coefficient test was ٠.٩٠.

III- Intern-Nurses' Attitude Questionnaire:

A structured questionnaire was developed by the researcher based on scientific literature review (***Suppiah Dall, ٢٠١٤; Olok, Yagos, & Ovuga, ٢٠١٥; Wang, Ho, & Chen ٢٠١٥; Zamarripa-Zoucha, ٢٠١٥; Ismail, ٢٠١٧; Andrew, Taylorson, & Langille ٢٠١٨; Choi, ٢٠١٨; Gajanayake, Sahama, , & Iannella, ٢٠١٣).*** It consisted of "٨٦" items to determine intern-nurses' attitude toward using electronic health records software by using advanced mobile devices before, immediately post and follow up after three months implemented of training program divided into ٨ dimensions distributed as follows;

١st dimension optimism (٧ items), ٢nd innovation (٧ items), ٣rd discomfort (٧ items), ٤th insecurity (٩ items), ٥th usefulness (١٨ items), ٦th satisfaction (٢٠ items), ٧th access to information (١١ items) and ٨th preference (٧ items).

Scoring system

The scoring system for Intern-nurses' attitude was calculated according to a three-point likert scale ranges from: disagree (٠ point), uncertain (١ points) and agree (٢ points). The score was reversed for negative items. Scores of each dimension summed up and converted into percent scores.

Each intern- nurse chooses only one best answer after reading and understanding the items carefully. Finally, the answer was assigned numerical values according to the following scores that reflect intern- nurses' attitude toward using electronic health records software by using advanced mobile device

The total attitude score (١٧٢ degrees)

- positive attitude if the percentage score is ≥ ٧٥ % (١٢٩ - ١٧٢ degrees),
- Negative attitude if the percentage score if the percentage score is < ٦٠ % (١ < ١٠٣ degrees)

Reliability

This tool was tested for reliability to estimate the consistency of measurement. Reliability was done using Alfa Coefficient test was ٠.٩٨.

Ethical considerations

The study protocol was approved by the research and ethics committee at the Faculty of Nursing Benha University. Intern- nurses were informed about their rights to withdraw from the study at any time without the need for giving any reason. Also they were assured that the information will be utilized for scientific research only. A verbal consent for participating in the study was also obtained from intern-nurses. In addition, confidentiality and anonymity of the subjects were ensured through coding of all data.

Statistical analysis

Data were verified prior to entry into the computer. The Statistical Package for Social Sciences (SPSS version ٢٠) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). The statistical tests were used as Paired (t) test was used to compare mean scores between the same sample at different study phases while Chi square was used for number and percent distribution, and Spearman correlation test (r) was used to define correlation among socio- demographic characteristics and the study sample at different study phases. A highly significant level value was considered when $p \leq ٠.٠٠١$, while a significant level value was considered when $p \leq ٠.٠٥$, and insignificant when $p > ٠.٠٥$.

Limitations of the study

The researcher was confronted with a few obstacles during the implementation of the study as:

Administrative limitation:

- The time for giving the session for intern-nurses who were distributed in different units was difficult to be organized.
- Obtaining training classes in some time were so difficult because the student of faculty of medicine were using these training classes.
- Obtaining a patient file was difficult because the nursing staff work load add to the fact that the ticket is not organized and the patient information is unclear and incomplete.

Technical limitation:

- There were some problems with internet connections, such as the speed or the absence of a mobile signal where they were staying.
- The difficulty of downloading the application due to the speed the internet because it is an internet package and internet memory stick (Internet flash) and the cost to the researcher Net package.

Which lead to distribution of the intern-nurses group into subgroups and sometime intern-nurses were requested to complete the EHRs sheet in the home as the availability of Wi-Fi connection and send them back to the researcher to complete the observation.

Results

Table (١): This table shows that nearly more than half of intern-nurses (٥٦.٧ %) had age more than ٢٢ years old with Mean ± SD (٢٢.٣٣±.٥٤), the majority of intern-nurses (٨٠.٠ %) were female, more than three quarters of intern-nurses (٧٦.٧٪) were single and all intern-nurses (١٠٠٪) have Medical Apps installed on their mobile device. In relation to their place of living, the highest percent of inter-nurses (٩٠٪) are living at rural areas. In regarding to their thought that hospital employers should establish policy for personal communication devices use the majority of them (٨٣.٣ %) thought that hospital employers should establish policy for personal communication devices use.

Table (٢): This table reveals that there was improvement in mean score of intern-nurses' knowledge regarding electronic health records software at immediate post program implementation phase as compared to the pre -program phase (٧٥.١١±١٥.٢٤ & ٣٩.٩٥±٢١.٦١) respectively. However, a slight mean decline (٦٧.٩٣±٢١.٢٠) occurred during follow-up phase. Also, the table shows that there was a highly statistical significant difference between intern-nurses' total knowledge scores regarding electronic health records software throughout program phases (p = ٠.٠٠٠**).

In addition to, the table shows that there was a highly statistically significant improvement in intern-nurses' total knowledge scores in relation to electronic health records software (١٦.٦٠±١٠.٦٧) at pre- program phase (before intervention) and it increased to (٣٣.٣١±٨.٤٥) at immediate post program implementation phase while it was decreased (٣٠.١٣±١٠.٦٦) at follow-up phase of the program but still more than pre-program.

Table (٣): This table clearly indicates that there was improvement in mean score of intern-nurses' required technological skills for using electronic heath records software and their actual performance at follow-up phase and immediate post program implementation as compared to the pre -program phase (٨٠.٧٠±١٣.١٢ -٧٩.٤٦±١٤.٤٧ & ٣٧.٨٥±١٥.٣٧) respectively. Also, the table shows that there was a highly statistically significant difference between intern-nurses' required technological skills for electronic heath records software and their actual performance throughout program phases (p = ٠.٠٠٠**).

In addition to, the table shows that there was a highly statistically significant improvement in intern-nurses' total scores of required technological skills for using electronic heath records software and their actual performance in relation to Total Informatics literacy & management skills (٢.٢٠±٢.٢٩) at pre- program phase (before intervention) and it improved to (١١.٤٦±٢.٠١) at immediate post program implementation phase and follow-up phase of the program.

Table (٤): This table clearly illustrates that there was improvement in mean score of intern-nurses' total attitude toward electronic heath records software at follow-up and immediate post program implementation phases as compared to the pre -program phase (١٥٠.٨٥٢٦.٢٩ - ١٤٧.٥٥٣٢.٠٦ & ٩٠.٨١٤٠.٧٩) respectively. Also, the table shows that there was a highly statistically significant difference between total score of intern-nurses' attitude toward electronic heath records software and their actual performance throughout program phases (p = ٠.٠٠٠**).

In addition to, the table shows that there was a highly statistically significant improvement in intern-nurses' total attitude toward electronic heath records software scores in relation to total discomfort and total insecurity at pre- program phase (before intervention) (٣.٨٨±٣.٦٧& ٤.٧١±٣.٤٢) respectively and it improved at immediate post program implementation phase and follow-up phase of the program to (١٠.٢١±٤.٢٥& ١١.٥٦±٤.٠٨) respectively.

Table (٥): Findings of the table display that there was a highly statistically significant positive correlation among intern-nurses' total knowledge, technological skills and attitude toward electronic health record software at pre-program, immediate post and follow up program implementation phases. This means that intern-nurses' knowledge regarding EHRs has been increased, then their technological skills has been improved and accordingly their attitude toward electronic health record software has been increased.

Figure (١): Illustrates that half of intern-nurses (٥٠.٠٪) had positive feeling level toward AMDs utilization in clinical practice and one third of them (٣٠.٠٪) had strongly

positive feeling level toward AMDs utilization in clinical practice. While fifth of them (٢٠.٠٪) had negative feeling level toward AMDs utilization in clinical practice

Figure (٢): Clearly indicates that there was a highly statistical significant improvement in knowledge levels regarding electronic health records software after intervention both post and follow up phases after three months of program from the preprogram phase. The majority of intern-nurses (٧٨.٣ %) had inadequate knowledge scores about electronic health records software utilization in clinical practice at pre-program implementation phase before intervention. While the highest percent of them (٩٠٪) had adequate knowledge scores about electronic health records software utilization in clinical practice at immediate post program implementation phase

Figure (٣): Clearly shows that there was a highly statistical significant improvement in intern-nurses' total technological skills required for using electronic health records software after intervention both post and follow up phases after three months of program from the preprogram phase. Moreover, nearly two thirds of intern-nurses (٥٨.٣ %) had low technological skills level at pre-program implementation phase before intervention. While the majority of intern - nurses had high technological skills level at follow up phase and immediately post-program implementation phase (٨٣.٣٪ & ٧٦.٦٪) respectively.

Figure (٤): Clearly illustrate that there was a highly statistical significant improvement intern-nurses' attitude toward electronic health records software level after intervention for both post and follow up phases after three months of program from the preprogram phase. More than half of intern-nurses (٥٥.٠ %) had a negative attitude toward electronic health records software at pre-program implementation phase before intervention. While the highest percentage of intern - nurses had a positive attitude toward electronic health records software at follow up and immediately post-program implementation phases (٨٦.٧٪ & ٨٥.٠٪) respectively.

Table (١): Frequency distribution of studied intern-nurses personal data regarding personal characteristics (No= ٦٠)

Personal characteristics	No	%
Age		
Less than ٢٢	٢٦	٤٣.٣
More than ٢٢	٣٤	٥٦.٧
Mean ±SD ٢٢.٣٣±.٥٤		
Gender		
Male	١٢	٢٠.٠
Female	٤٨	٨٠.٠
Marital status		
Single	٤٦	٧٦.٧
Married with children	٨	١٣.٣
Married without children	٦	١٠.٠
Place of living (residence)		
Urban	٦	١٠.٠
Rural	٥٤	٩٠.٠
Pre-university education		
Secondary school	٤١	٦٨.٣
Technical nursing diploma	١٩	٣١.٧
Do you have a computer		
No	١٧	٢٨.٣
Yes	٤٣	٧١.٧
Have Medical Apps installed on your mobile device?		
No	٠	٠.٠
Yes	٦٠	١٠٠.٠
Do you think hospital employers should establish policy for personal communication devices use?		
No	١٠	١٦.٧
Yes	٥٠	٨٣.٣

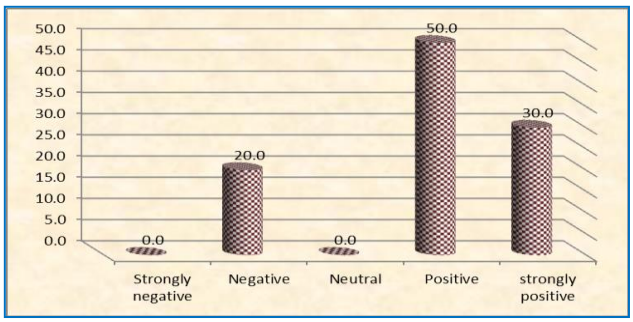

Fig١: Percentage distribution of intern-nurses' feeling levels toward AMDs utilization in clinical practice

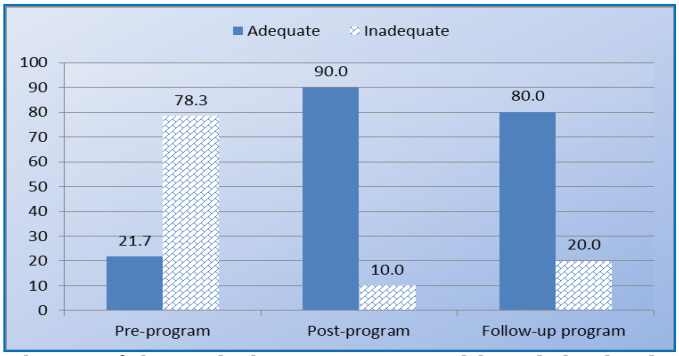

Fig٢:Percentage distribution of the Studied intern-nurses' total knowledge levels regarding electronic health records software throughout the program phases

Table (٢): Comparisons of studied intern-nurses' total knowledge scores about electronic health records software throughout the program phases (No= ٦٠)

Dimensions of knowledge	Maximum score	Program phases: Pre program	Mean percent	Immediate post program	Mean percent	Follow up program	Mean percent	Paired t test (١)	Paired t test (٢)	Paired t test (٣)
		No= (٦٠)								
Nursing informatics	٢٩	١٠.٥٨±٥.٩٨	٣٦.٤٨	٢٢.٣٠±٤.٨٧	٧٦.٨٩	١٩.٨٨±٦.٩٥	٦٨.٥٥	٢١.٧٦٢**	٤.٩١٣**	١٣.٣٩٤**
Advanced mobile devices	٢٢	١٢.٧٦±٦.١٢	٥٨	١٩.٥٠±٣.٣٩	٨٨.٦٣	١٧.٩١±٤.٨٨	٨١.٤٠	١٠.٦٤٧**	٣.٦٠٠**	٩.٠٨٥**
Electronic health records	٤١	١٦.٦٠±١٠.٦٧	٤٠.٤٨	٣٣.٣١±٨.٤٥	٨١.٢٤	٣٠.١٣±١٠.٦٦	٧٣.٤٨	١٣.٩٠٥**	٤.٣٢٤**	١٠.٨٦٨**
Total scores	٩٢	٣٩.٩٥±٢١.٦١	٤٣.٤٢	٧٥.١١±١٥.٢٤	٨١.٦٤	٦٧.٩٣±٢١.٢٠	٧٣.٨٣	١٧.٩٧١**	٤.٥٦٦**	١٣.٣٢٥**

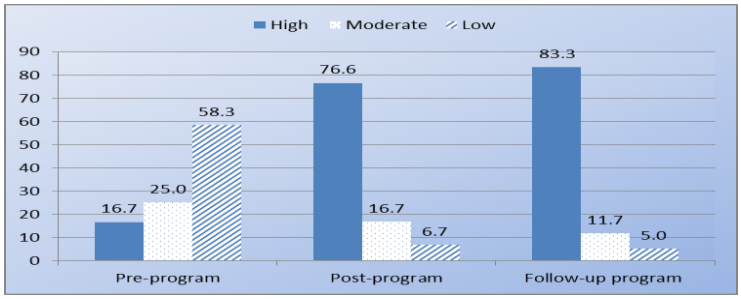

Fig٣: Percentage distribution of the Studied intern-nurses' total technological skills required for using electronic health record software through the program phases

Table (٣): Comparisons of studied intern-nurses' total required technological skills scores for using electronic health records software through the program phases (No= ٦٠)

Technological skills dimensions	Maximum score	Program phases: Pre program No= (٦٠)	Mean percent	Immediate post program	Mean percent	Follow up program	Mean percent	Paired t test (١)	Paired t test (٢)	Paired t test (٣)
Technological skills required for using EHRs	٥٠	١٨.٩١±٩.٥٣	٣٧.٨٢	٤٢.٢٣±٨.٨٢	٨٤.٤٦	٤٣.١٠±٨.٢٢	٨٦.٢	٢١.٠٧٠**	٢.٩٦٣*	١٦.١١٩**
Informatics literacy & management skills	١٢	٢.٢٠±٢.٢٩	١٨.٣٣	١١.٤٦±٢.٠١	٩٥.٥	١١.٤٦±٢.٠١	٩٥.٥	٢٧.٣٠٥**	-/-	٢١.٢٦٢**
Total Technological skills	٦٢	٢١.١١±١١.٤٠	٣٤.٠٤	٥٣.٧٠±١٠.٣٧	٨٦.٦١	٥٤.٥٦±٩.٧٩	٨٨.٠	٢٣.٩٨٩**	٢.٩٦٣*	١٨.٢٨٠**
Actual performance(data entry)	٢٨	١٦.٧٣±٤.٨٣	٥٩.٧٥	٢٥.٧٦±٤.٦٤	٩١.٩٢	٢٦.١٣±٤.٠٤	٩٣.٣٢	١٥.١٦٦**	٢.١٢٠*	١٢.٧٨٨**
Total scores	٩٠	٣٧.٨٥±١٥.٣٧	٤٢.٠٥	٧٩.٤٦±١٤.٤٧	٨٨.٢٨	٨٠.٧٠±١٣.١٢	٨٩.٦٦	٢٣.٨٥٥**	٢.٩٩٩*	٢٤.٥٨٣**

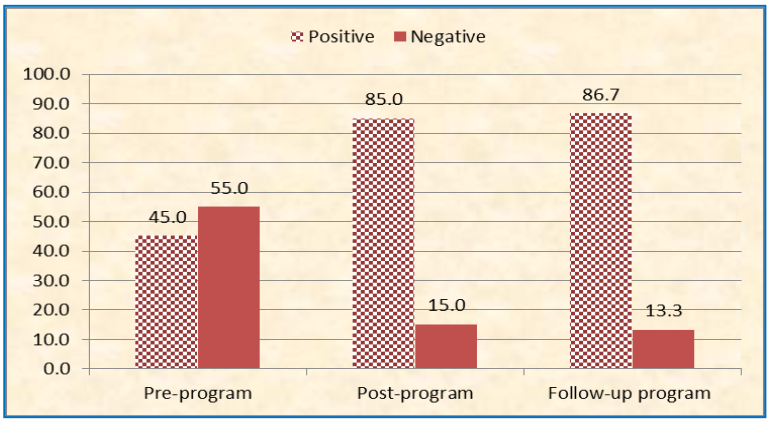

Fig ٤: Percentage distribution of the Studied intern-nurses' total attitude toward electronic health records software through the program phases

Table (٤): Comparisons of studied intern-nurses' total attitude scores toward electronic health records software through the program phases (No= ٦٠)

Dimensions of attitude	Maximum score	Program phases: Pre program	Mean percent	Immediate post program	Mean percent	Follow up program	Mean percent	Paired t test (١)	Paired t test (٢)	Paired t test (٣)
				No= (٦٠)						
Total optimism	١٤	٦.٤٣±٤.٥٧	٤٥.٩٢	١١.٣٦±٣.١٦	٨١.١٤	١١.٧٠±٢.٨٦	٨٣.٥٧	١٠.٧٤٩**	٢.٨٢٤*	١١.٠٥٣**
Total innovation	١٤	٧.٩٠±٣.١٩	٥٦.٤٢	١٣.٠٣±١.٨٣	٩٣.٠٧	١٣.٣١±١.٤٦	٩٥.٠٧	١٤.٦٤٥**	٢.٤٨١*	١٤.٥٢١**
Total discomfort	١٤	٣.٨٨±٣.٦٧	٢٧.٧١	١٠.٢١±٤.٢٥	٧٢.٩٢	١٠.٢١±٤.٢٥	٧٢.٩٢	١٢.٦٩٣**	-/-	١٢.٦٩٣**
Total insecurity	١٨	٤.٧١±٣.٤٢	٢٦.١٦	١١.٥٦±٤.٠٨	٦٤.٢٢	١١.٥٦±٤.٠٨	٦٤.٢٢	٢٠.٢٨٦**	-/-	٢٠.٢٨٦**
Total usefulness	٣٦	٢٣.٥٨±٨.٧٢	٦٥.٥	٣٣.٧٦±٤.٤٧	٩٣.٧٧	٣٤.٢١±٣.٥٨	٩٥.٠٢	١٢.٠١٠**	٢.٠٢٥*	١١.٨٦٨**
Total satisfaction	٤٠	٢٦.١٠±١٠.٦١	٦٥.٢٥	٣٧.٢٣±٨.٠٨	٩٣.٠٧	٣٨.٣٠±٥.٩٥	٩٥.٧٥	٨.٤٩٢**	١.٧٢٠*	٩.٤٠٣**
Total access to information	٢٢	١١.٤٦±٥.٨٧	٥٢.٠٩٠	١٧.٤٣±٦.٩٣	٧٩.٢٢	١٨.٠٣±٦.١٥	٨١.٩٥	٨.٢٧٢**	٢.٤٩٧*	٩.٣٠٦**
Total preferences	١٤	٦.٧٣±٥.٥٢	٤٨.٠٧	١٢.٩٣±٢.٩٣	٩٢.٣٥	١٣.٥٠±٢.١٨	٩٦.٤٢	٩.٠٥٠**	٢.١٢٩*	٩.٤٧٢**
Total scores	١٧٢	٩٠.٨١٤٠.٧٩	٥٢.٧٩	١٤٧.٥٥٣٢.٠٦	٨٥.٧٨	١٥٠.٨٥٢٦.٢٩	٨٧.٧٠	١٤.٤٧١**	٢.٢٨٩*	١٥.٢٣٥**

Table ٥: Correlation matrix between studied variables of intern-nurses (total knowledge, skills and attitude) through the program phases

Studied variables		Intern-nurses: Pre-program (N= ٦٠)			Post-program (N= ٦٠)			Follow up (N= ٦٠)		
		Knowledge	Skills	Attitude	Knowledge	Skills	Attitude	Knowledge	Skills	Attitude
Knowledge	r	١	.٨٠٥**	.٧٨٤**	١	.٨٩٥**	.٧٨٦**	١	.٦٥٢**	.٦١٨**
	P value	---	.٠٠٠	.٠٠٠	----	.٠٠٠	.٠٠٠	-----	.٠٠٠	.٠٠٠
Technological skills and data entry	r	.٨٠٥**	١	.٧٤٩**	.٨٩٥**	١	.٨٦٣**	.٦٥٢**	١	.٨٦٢**
	P value	.٠٠٠	-------	.٠٠٠	.٠٠٠	----	.٠٠٠	.٠٠٠	--------	.٠٠٠
Attitude	r	.٧٨٤**	.٧٤٩**	١	.٧٨٦**	.٨٦٣**	١	.٦١٨**	.٨٦٢**	١
	P value	.٠٠٠	.٠٠٠	-------	.٠٠٠	.٠٠٠	-----	.٠٠٠	.٠٠٠	-----

Discussion

Regarding to the personal characteristics of intern-nurses, the findings of the present study revealed that more than half of intern-nurses had age more than ٢٢ years old with Mean ± SD (٢٢.٣٣±.٥٤), the majority of them were female, and more than three quarters of them were single and are living at rural areas.

The result of the present study was consistent with Olajubu, Irinoye, & **Olowokere, (٢٠١٤)** as they found that the majority of the respondents were females. Also **Chan, et al., (٢٠٢٠)** as they found that the

majority of the respondents were females with an average age of ٢٢.٣ years. Moreover, **Mayer, Blanco, & Torrejon, (٢٠١٩)** as they reported that most participants were female and single. In addition to this result was in agreement with **Cnossen, Heetderks, & Pettigrew, (٢٠١٥) and Ismail, (٢٠١٦)** as they reported that the highest percent of participants live in rural area.

As regarding to **intern-nurses' feeling levels toward AMDs utilization in clinical practice** the findings of the present study illustrated that half of intern-nurses had positive feeling toward AMDs utilization in clinical practice and one third of them had strongly positive feeling toward AMDs utilization in clinical practice. While fifth of them had negative feeling toward AMDs utilization in clinical practice. This might be due to that mobile technologies have been developed and trialed in nursing education as a way to provide better access to quality educational material that is accessible anywhere and anytime.

This result was in agreement with **Deborah, (٢٠١٤)** who reported that most of the study participants had slightly positive feeling and more than one third of them had strongly positive feeling toward AMDs utilization in nursing care

Concerning intern-nurses' knowledge regarding electronic health records software the findings of the present study indicated that there were a highly significant improvement in knowledge levels regarding electronic health records software after intervention both post and follow up phases after three months of program from the preprogram phase. From the researcher point of view this result may be due to using an AEHR helps “create a technology rich learning environment for students, exposing them to evidence-based practice, standardized nursing language, and informatics competencies and the researcher ability to diversify in communicating content with the use of different educational methods and utilization of such advanced mobile devices as these generations are very passionate about AMDs and any way of modern technology.

This finding is supported by **Jenkins, et al., (٢٠١٨)** as they stated that the benefits to nursing faculty of implementing an AEHR are found in the type of learning that takes place when students interact with this technology and found that students using an AEHR were constructing their own knowledge by learning from clinical cases, learning by analyzing clinical problems, and learning in a collaborative manner.

In the same line **VanLangen, et al., (٢٠٢٠) and Fennelly, et al., (٢٠٢٠)** as they reported that Academic EHRs are an important addition to the nursing curriculum. Exposure to this technology throughout professional education allows nursing student to begin acquiring knowledge and skills related to health informatics in order to be an effective member of the healthcare team.

The findings of current study indicated that there was a highly significant improvement in intern-nurses' technological skills for using electronic health records software after intervention both post and follow up phases after three months of program from the preprogram phase.

From researcher point of view From researcher point of view this improvement may be due to application of EHRs software by using advanced mobile devices for intern-nurses and teaching them how to send an email with attachment, use search engine & accessing the internet, enter her or his email and his password, move between EHRs different sheet, enter complete and accurate data quickly with allowed time, save the entered data and can recall the folders at next time all of this making the students deal more with PDAs and technological issues.

In addition to , this improvement in the performance of the intern-nurses could have resulted from their readiness to learning new skills to facilitate their work and increases their efficacy as after their graduation they may be wok in hospital use such this system at this time they already receive an experience which make them more confident and proficient. While the increase that occurred in skills scores at the follow-up phase could be explained in the light of appearance of corona virus as it has forced a sudden migration to online learning by using either desktop computers or handheld computers and activating blended learning. As the pandemic accelerated, colleges shifted into emergency mode, shutting down campuses in an effort to prevent the spread of COVID-١٩. All of this makes intern-nurses more skilled.

The foregoing findings were in agreement with **Bowling, (٢٠١٦)** who showed that there was an increase in electronic documentation skill performance. All students rated the ease of completing the electronic documentation systems as very easy and easy.

In this regard, **Samadbeik, et al., (٢٠٢٠)** they reported that there is an improvement in EMR proficiency and technical skill of nursing intern after implementation of mobile AEMR academic EHR.

The result of present study illustrated that there was a highly significant improvement intern-nurses' attitude toward EHRs software level after intervention for both post and follow up phases after three months of program from the preprogram phase. Additionally more than half of intern-nurses had a negative attitude toward electronic health records software at pre-program implementation phase before intervention.

From the researcher point of view this may be due to intern- nurses during their academic training they already saw paper documentation and how it consume nursing staff time not only this but also patient ticket is not organized, in some time nurses leave the patient ticket on the counter and thus threatening the patient's privacy and nurses consume a great time in documentation and not have enough time to stay with patient but after implementing the EHRs software program they notice the big difference between it and paper documentation in terms of the organization, saving time and effort as result nurses will have enough time to stay with patient and maintain patient privacy.

This result of the present study was matched with **Secginli, Erdogan & Monsen, (٢٠١٤)** as they found that overall positive attitudes towards EHRs among primary care health professionals. Also **Adams, (٢٠١٥)** who found that there is a positive increase in posttest scores of nurses' attitude and self-efficacy toward the EHR system after implementation of EHR program. In the same line **Kipturgo et al., (٢٠١٤)** as they reported that nurses had a favorable and positive attitude towards computerization and other computing system and tend to become ready to use computing systems in clinical practice. In addition to **Wesam, et al., (٢٠١٦)** they reported that the nurse's overall readiness toward EHRs is considered at a high level.

The foregoing findings were in agreement with **Olok, Yagos, & Ovuga, (٢٠١٥)** they reported that majority of healthcare team had positive attitudes towards e-health attributes. The level of skills was moderate and **Dhopeshwarkar, Kern, & O'Donnell (٢٠١٢)** they found that respondents were generally comfortable with storage of information on a single, central database that can be accessed over a secure password-protected connection. Moreover **Andrew, Taylorson, Langille (٢٠١٨)** they reported that the majority of participants enjoy using technology, believe it is useful for learning and their future jobs.

Findings of the present displayed that there was a highly Statistically significant positive correlation between intern-nurses' technological skills required for using electronic health record software with their **knowledge** at pre- program, immediate post and follow up program implementation phases Also, there was a highly Statistically significant positive correlation between intern-nurses' attitude toward using electronic health record software with their **knowledge** at pre-program, immediate post and follow up program implementation phases.

The result of the present study was in accordance with **Olok, Yagos, & Ovuga, (٢٠١٥)** as they reported that there is positive correlation between intern-nurses attitude toward EHRs with AMDs and their skills and **Mijin, Jang, Choi, & Khongorzul, (٢٠١٩) as** they found that there is a positive relationship between perceived ease of use and perceived usefullness and attitude and knowledge.

Conclusion

The present study concluded that implementing electronic health records (EHRs) software was effective. The highest percent of intern-nurses had adequate knowledge scores about EHRs at immediately post-program implementation phase, the majority of them had high technological skills level required for using EHRs, and positive attitude toward EHRs at follow up and immediately post-program from the preprogram implementation phases. There was highly statistically significant positive correlation among intern-nurses' knowledge regarding EHRs software with their technological skills required for toward using EHRs software, with total performance scores and attitude toward EHRs software at pre- program, immediate post and follow up program implementation phases.

Recommendation:

Based on the findings of the present study, the following recommendations are proposed;

The hospital administration should take the necessary steps to develop proper ICT infrastructure required for EHRs records utilization with AMDs in clinical practice.

Academic nurse leaders should establish nursing informatics skills for nursing students and nurses by continuing education, training and classroom teaching with practical classes. Also need to integrate IT based NI into the nursing theory and practical session in order to improve nursing informatics skills and address unwarranted variations and enhance outcome.

- Nursing students had a positive attitude about EHRs software, so in order to make more use of this software in providing qualitative care to the patients,

using this software in the areas of teaching, research and clinical practice of students is recommended.

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