Enhancing Pediatric Nurses' Performance in the Digital Era Regarding Electronic Health Records: Readiness and Challenges

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Abstract

Background: Electronic Health Records (EHRs) enable healthcare team members to capture patient data from many disciplines and communicate that data to improve child care management and outcomes. Nonetheless, challenges have arisen with the shift from paper-based to digital platforms, particularly for healthcare professionals. **Aim:** The study aimed to evaluate the effectiveness of educational intervention in enhancing pediatric nurses' performance in the digital era regarding EHRs. **Research design:** This study used a quasi-experimental (pre- and post-) research design. **Sampling:** A convenience sample of 240 pediatric nurses. **Settings:** The critical and non-critical units at the Pediatric Hospital affiliated with Ain Shams University Hospitals. **Tools:** Data was collected using Tool I: Structured Interviewing Questionnaire, which included nurses' characteristics and knowledge regarding EHRs. Tool II: Nurses' Perceptions Questionnaire about EHRs. Tool III: Challenges Questionnaire of EHRs Integration and Utilization. Tool IV: Nurses' Satisfaction Questionnaire Towards EHRs Integration and Use. **Results:** More than three-quarters of nurses reported high obstacles across all challenging dimensions regarding EHRs. Also, more than four-fifths of nurses were unsatisfied with various aspects of the EHRs system. In addition, after implementing the educational intervention, most nurses had satisfactory knowledge and positive perceptions regarding EHRs compared to less than one-fifth pre-intervention. There was a positive correlation between nurses' knowledge of EHRs and their perceptions regarding integrating EHRs in healthcare for pediatric patients. **Conclusion:** Several significant challenges to the integration and use of EHRs were faced by nurses, and they expressed dissatisfaction with the EHRs system. However, nurses' knowledge and perceptions of EHRs were markedly improved by the implementation of an educational intervention. Furthermore, the study findings underscore the critical role of knowledge in shaping nurses' perceptions towards EHRs. **Recommendations:** Addressing EHRs integration obstacles requires a comprehensive approach. The educational programs and continuous training of healthcare professionals enable smoother implementation and greater acceptance of EHR systems in healthcare settings.

Keywords: Challenges, Digital Era, Electronic Health Records, Pediatric Nurses, Performance, Readiness.

Introduction

Electronic health records (EHRs) are on the brink of a revolution in healthcare due to the digital era. Electronic health records have become integral to modern healthcare systems, offering benefits such as improved patient care, enhanced data accuracy, and more efficient workflows **(Ahamad, 2023)**. In pediatric nursing, the adoption of EHRs is particularly significant because of the unique needs of child patients and the critical role nurses play in their care. The readiness of pediatric nurses to embrace EHRs is influenced by various factors, including their level of training, familiarity with technology, and the availability of adequate infrastructure **(Roy et al., 2024)**.

Pediatric nurses' clinical documenting methods have advanced significantly, largely due to EHRs. Research indicates that compared to traditional paper records, EHRs enhance the completeness and quality of patient information, including histories, physical examinations, and care plans **(Smith et al., 2020a & Smith et al., 2020b)**. Furthermore, it has been shown that the use of EHRs improves clinical documentation

and care coordination, among other aspects of pediatric nursing care **(Johnson et al., 2019)**.

Electronic health records are the most widely used application of big data in healthcare. These systems store digital records of longitudinal data that are gathered from patients in healthcare facilities **(Luan et al., 2023).** Although pediatricians' use of EHRs has become nearly universal in the United States, less than 17% of pediatric offices surveyed in 2016 reported using EHRs with full pediatric functionality, which would include comprehensive functionality like tracking adherence to immunization schedules and basic functionality like weight-based dosing **(Temple et al., 2019).** Although there are many benefits to the transition from paper-based to electronic recording, there are also new regulatory obligations, threats to the value of child notes, and potential to take advantage of clinical documentation for other purposes **(Tutty et al., 2019).**

Evidence now supports the use of EHRs to decrease drug errors, improve guideline adherence, and enhance other health care quality metrics. However, the quick uptake of EHRs has also led to unforeseen and undesirable outcomes, such as the EHRs' poor usability. According to the International Organization for Standardization (2018), usability is the degree to which technology can be utilized effectively, efficiently, and satisfactorily. Clinicians become frustrated and burn out as a result of poor EHR usability **(Melnick et al., 2020)**. Strict and reliable usability metrics are required to pinpoint particular issue areas, monitor the impact of improvement initiatives, and enable product comparisons so that customers may buy the best products for their needs to improve EHR usability **(Overhage & Johnson, 2020)**.

The current trend focuses on enhancing nurse diagnosis information programs to select the most effective treatments and improve care quality. Work processes could be streamlined, activities could be tracked for evaluation, nursing care could be standardized, paper-based practices could be eliminated, research resources could be made available, tasks could be distributed among nurses, and overall activities could be improved by implementing electronic nursing files **(Fennely et al., 2021).**

Only a few healthcare facilities have successfully adopted the use of gadgets and technologies for storing health information. Healthcare facilities in developing countries have certain challenges while attempting to install EHR systems **(Oluwatuyi, 2020).**

Pediatric nurses are vital to the management of children's health and well-being, and providing high-quality care requires that they are prepared to use EHRs efficiently. Although EHRs can improve patient outcomes and communication, they also present usability and safety issues that may affect healthcare providers' productivity and satisfaction **(Ahamad, 2023).** For instance, challenges with data entry, alert fatigue, and interoperability might make it difficult to use EHRs effectively. According to **Roy et al., (2024),** pediatric nurses' preparedness to accept EHRs and guarantee their successful deployment also depends on their level of training, technological proficiency, and infrastructure availability.

Significance of Study

Nowadays, nursing jobs are becoming more complex due to technology. The EHR is used by healthcare organizations for data collecting, communication, and decision-making as they integrate additional health information technologies **(Rashed et al., 2022)**. Electronic health records allow members of the healthcare team to securely share patient information, enhance care, lower unnecessary testing, and reduce mistakes. Furthermore, some studies indicated that medical errors could result from a lack of knowledge about how EHRs work **(Jedwab et al., 2019; Samadbeik et al., 2020)**. At Ain Shams Pediatric Hospital, an EHRs system is being newly implemented, and pediatric nurses are undergoing training for this change to

adjust to the new digital documentation procedures. The researchers' initial observations show that nurses face significant challenges, including concerns about a lack of knowledge about EHRs, increased workload, limited digital skills, and patient care quality. Therefore, this study was conducted to evaluate the readiness of pediatric nurses to embrace EHRs and the challenges they face in the digital era to improve their performance regarding EHRs. The researchers expect the findings to support the successful integration of EHRs, ultimately enhancing the efficiency and accuracy of pediatric healthcare delivery in the digital era.

Aim of the study

This study aimed to evaluate the effectiveness of educational intervention in enhancing pediatric nurses' performance in the digital era regarding electronic health records (EHRs) through the following objectives:

1. Evaluating pediatric nurses' readiness (knowledge and perceptions) regarding integrating EHRs into healthcare for pediatric patients.
2. Identifying pediatric nurses' satisfaction level and challenges that hinder the effective integration and use of EHRs.
3. Designing and implementing an educational intervention to enhance pediatric nurses' integration of EHRs.
4. Evaluating the effect of educational intervention on pediatric nurses' readiness regarding the EHRs integration in health care for pediatric patients.

Research hypotheses

H_1: Pediatric nurses experience lower satisfaction and face more significant challenges when integrating and using EHRs.

H_2: Educational intervention has a positive effect on pediatric nurses' knowledge and perceptions regarding integration of EHRs in healthcare for pediatric patients in the posttest compared to pre-intervention.

H_3: There is a positive correlation between nurses' knowledge and perceptions score levels.

Operational definition

Readiness means knowledge and perceptions

Subject and Methods

Research Design:

A quasi-experimental (pre- and post-) research design was utilized in this study.

It is a research methodology that is employed to investigate the impact of independent variables on dependent variables when complete experimental control is either impractical or unethical. Although it replicates certain features of experimental research, it lacks randomization. The primary goal of quasi-experimental design is to study the link between cause and effect between variables **(Nichols & Edlund, 2023)**.

Settings:

This study was conducted in the critical and non-critical units at the Pediatric Hospital affiliated with Ain Shams University Hospitals in Cairo, Egypt. This setting provides comprehensive pediatric care, and it is being newly implemented EHRs system.

Subject:

A convenience sample of 240 pediatric nurses. It was composed of all available pediatric nurses working in the previously mentioned setting.

Inclusion criteria included:

- Nurses working in critical and non-critical care units in the selected setting.
- Nurses willing to participate in the study.

Exclusion Criteria included:

- Nurses who were on extended leave during the data collection period.

Tools of data collection

Data was collected through four tools as follows:

Tool I: Structured Interviewing Questionnaire:

It was designed by researchers according to the current related literature. It was written in simple Arabic language. It was divided into the following two parts:

Part 1: Nurses' characteristics: included age, gender, residence, educational level, years of pediatric nursing experience**,** working unit,

previous experience with the current EHRs system, attendance of training programs related to EHRs, and which of the following computer applications or concepts do you consider yourself to be proficient in.

Part 2: Nurses' knowledge regarding EHRs (Pre/post format): It included 20 multiple-choice questions and was adapted from **Adams, (2015)** to assess the nurses' knowledge regarding the definition, importance, components, advantages, and challenges of EHRs.

Scoring system

Researchers prepared the model answer; correct responses were checked through the following:

- One degree for a correct answer; meanwhile, zero for an incorrect answer or not knowing.
- The total score was 20. The nurses' responses were summed up, then converted into a percentage to be classified into two categories of knowledge level:

- Satisfactory ≥ 60% (12 -20 scores).
- Unsatisfactory <60% (<12 scores).

Tool II: Nurses' Perceptions Questionnaire about EHRs (pre/post format)

It was adopted from **Ramoo et al., (2023)** to assess nurses' perceptions regarding EHRs. It included six key domains. As the following: perception on EHRs system (eight items), perception on the effect of the EHRs system on pediatric patient care (seven items), perception on complexity of the EHRs system (five items), perception on the impact of the EHRs system on personal work (three items), perception on usefulness (six items), and perception on training needs (four items).

Scoring system:

The markers "1-strongly disagree," "2-disagree," "3-neutral," "4-agree," and "5-strongly agree" were used to grade the nurses' answers on a 5-point Likert scale. During the analysis, negative statements received a reversal score. The total perception scores were 165, which equal 100%. For ease of interpretation, they were therefore divided into two categories:

- Positive perceptions ≥ 60% (99 -160 scores).
- Negative perceptions < 60% (32 - 98 scores).

Tool III: Challenges Questionnaire of EHRs Integration and Utilization

It is adapted from **Boonstra & Broekhuis (2010)** to assess nurses' perspectives regarding challenges impeding EHRs integration and use pre-intervention. The tool categorizes challenges into six main obstacles: *Technical Obstacles* (e.g., lack of technical training, limited internet access). *Financial Obstacles* (e.g., initial high expenses, high ongoing expenses). *Psychological Obstacles* (e.g. lack of confidence in EHRs, worries about privacy and security). *Organizational Obstacles* (e.g., lack of leadership and management support). *Time Obstacles* (e.g., time required for learning and data entry). *Social Obstacles* (e.g. interference with nurse-patient interaction).

Scoring system:

Obtained responses from nurses were graded on a 5-point Likert scale with the markers "1-strongly disagree," "2-disagree," "3-neutral," "4-agree," and "5-strongly agree". Negative statements received a reversal score during the analysis. The total scores were 120 and were categorized as:

- High obstacles ≥ 75% (90 -120 scores).
- Moderate obstacles 60% - <75% (72 - 89 scores).
- Low obstacles <60% (24 - 71 scores).

Tool IV: Nurses' Satisfaction Questionnaire Towards EHRs Integration and Use

It is adopted from **Ramoo et al., (2023)** to assess nurses' satisfaction regarding EHRs pre intervention, consisted of 7 items (System performance speed, comfort in using the EHR system, adequacy of computer/laptop availability, acceptability of system outage durations, satisfaction with technical support (IT experts), timing of notices for system upgrades, overall satisfaction with the EHR system).

Scoring system:

Obtained responses from nurses were assessed using a 5-point Likert scale with the markers "1-strongly disagree," "2-disagree," "3-neutral," "4-agree," and "5-strongly agree". The total scores were 35 and were categorized as:

- High satisfaction ≥ 60% (21-35 scores).
- Low satisfaction <60% (7-20 scores).

Validity:

A board of three expert professors in pediatric nursing from the Faculty of Nursing at Ain Shams University assessed the study tools for clarity, comprehensiveness, appropriateness, and relevance. No modifications were needed.

Reliability:

The reliability of study tools was assessed by using Cronbach's alpha test. It was 0.900 for knowledge and 0.889 for challenges.

Ethical considerations:

Approval from the Ethical Research Committee in the Faculty of Nursing, Ain Shams University, was obtained on 13/5/2024 with ethical code 25.01.470. Every nurse who took part in the study provided a written consent and was told that their information would only be used for research purposes, that participation was completely voluntary, and that they could withdraw from the study at any time, not facing any consequences.

Pilot Study:

It was conducted on 10% of the study sample (24 nurses). It was carried out to ascertain the duration of data collection, verify item transparency, and identify any areas of uncertainty in the instruments. The 24 nurses in the pilot study were included in the study subjects.

Fieldwork

The actual fieldwork was carried out within seven months from the beginning of June 2024 to the end of December 2024 through the following phases:

A. Assessment phase:

It lasted for 8 weeks. The researchers at this phase were available five days/week (Saturday, Sunday, Monday, Wednesday, Thursday) in the morning shift (9 am - 2 pm) in the previously mentioned settings. The total number of nurses interviewed per week was 30. The aim of the study and the steps were clarified for the studied nurses. Nurses were interviewed individually for 30-40 minutes to assess their knowledge, perceptions, satisfaction, and challenges impeding EHRs integration and use. Using study tools as a pre-assessment before the implementation of nursing intervention.

B. Planning phase:

It lasted for 4 weeks. The researchers designed nursing educational intervention sessions by assessing the actual needs of the studied nurses to improve their knowledge and perception through using a guided booklet prepared by the researchers. It was designed in a simple and clear Arabic language based on the needs of the nurses. It used to provide nurses with important knowledge about the EHRs, including definition, importance, components, advantages, and challenges of EHRs.

C. Implementation phase:

It lasted for 8 weeks. The researchers started the sessions at critical and non-critical units at the Pediatric Hospital, Cairo, Egypt. The nurses were classified into 40 groups; each group of 6 nurses took 4 theoretical sessions. Each session lasted for 30 minutes, equally 2 hours for each group, and the total hours equal 80 hours for 40 groups through 8 weeks (10 hours each week distributed through five days).

The 1st session included an introduction and the aim of nursing intervention sessions, definition, and importance of EHRs. *The 2nd session* included the component of EHRs. *The 3rd session* included the advantages of EHRs. *The 4th session* included challenges of EHRs.

At the beginning of each session, the researchers provided feedback for the previous session and explained the objectives of this session, and at the end of every session, answered all nurses' questions. Different teaching strategies were used, such as modified lectures, role-play, and small group discussion. suitable and attractive teaching aids like a booklet, colored pictures, PowerPoint, and videos.

D. Evaluation phase

After completion of the sessions, the post-test was done for each nurse after two months of intervention by using the same study tools of knowledge and perception to evaluate the effect of intervention by comparing the results of the pre- and post-tests, and the researchers thanked all nurses at the end.

Administrative design

Official permission from the medical director of the previously mentioned setting was obtained to carry out the study. To explain the purpose and methods of data collection, the researchers met with the director.

Statistical analysis

After being gathered, the data was coded and input into a personal computer. Version 29 of the computer statistics package for social science (SPSS 24) was used to analyze it. The data collected was organized, reviewed, analyzed, and displayed in tables and figures as percentages and numbers. The significance of the results was tested using suitable and appropriate statistical tests, Pearson chi-square and Fisher's exact test.

>0.05 non-significant

<0.05* significant

<0.001** high significant

Results

Table (1): Reveals that less than half (45.9%) of nurses were between 20 to < 30 years old, followed by those aged 30 to < 40 years (35.8%), more than three-quarters (76.2%, 78.3%) of the nurses were female and reside in rural areas respectively, less than half (41.7%) of them had completed education at a technical nursing institute, and less than one quarter (22.9%) had a bachelor's degree in nursing science. Also, less than half (45.4%) of nurses with 10 to < 20 years of experience in pediatric nursing, more than two-fifths of nurses with less than 10 years of experience (42.1%), and (63.3%) worked in critical care units. Furthermore, more than half (54.2%) of nurses had 6 months to less than 1 year of experience with the current EHRs system. Nearly four-fifths (79.2%) of nurses did not attend any previous training programs related to EHRs. Among more than one-fifth (20.8%) who had attended such programs, most (90%) of them had only taken one course, while a minority (10%) had taken two courses.

Figure (1) shows that less than half (46.7%) of nurses considered themselves to have a basic understanding of initial computer concepts. Followed by 24.7% of them who were skilled in Microsoft Word. However, their proficiency levels in other specific applications were relatively low.

Table (2) highlights several significant challenges that nurses face regarding the integration and use of EHRs. (77.1%, 82.9%, 79.6%, 74.6%, 75.8%, & 65%) of nurses reported high levels of technical, financial, psychological, organizational, time-related, and social obstacles.

Table (3) demonstrates that the majority of nurses were unsatisfied with various aspects of the EHRs system prior to intervention. Only (11.3%15%, 8.3%, 9.5%, 12%, 14.6%, & 15.8%) of nurses mentioned that they were happy with the system's performance speed, felt comfortable using the EHR system, satisfied with the number of computers/laptops available, found the system outage duration acceptable, satisfied with the technical support, satisfied with the timing of the notices given regarding upgrading HERs system, and overall satisfied with the EHRs system respectively. Accordingly, the nurses' total satisfaction level of 15% versus 85% dissatisfaction underscores the need for significant improvements in the EHRs system to enhance user experience and efficiency. Addressing these issues could lead to better adoption and more effective use of the system by the nursing staff.

Figure (2) shows that most (92.9%) of nurses have satisfactory knowledge regarding HERs after the intervention, in comparison with (16%) of them pre-intervention, with a statistically significant difference ($\chi 2$=34.077, p-value = .000).

Table (4) reveals that the majority **(**87.5%, 89.6%, 87.5%, 87.1%, 86.7, & 87.5%) of nurses have a positive perception post-intervention regarding EHRs system, the benefit of the EHRs system on pediatric patient care, the complexity of the EHRs system, impact of EHRs system on personal work, usefulness, and training needs on EHRs, while less than one-quarter (16.7%, 13.8%, 22.5%, 10.4%,18.7% & 24.6%) of them pre-intervention respectively. Accordingly, most (90%) nurses have a positive perception in post-intervention regarding the total perception of EHRs compared to less than one-fifth (18%) pre-intervention, with a highly statistically significant difference (p = 0.000).

Table (5) indicates a positive correlation between nurses' total satisfaction regarding the integration of EHRs in healthcare for pediatric patients and their knowledge, perception of EHRs pre-intervention, with statistically significant (r = 0.197, P-value = 0.000**) (r = 0.174, P-value = 0.000**) respectively.

Table (6) indicates a positive correlation between nurses' knowledge of EHRs and their perceptions regarding the integration of EHRs in healthcare for pediatric patients, with a statistically significant (r = 0.82, P-value = 0.001).

Table (1): Frequency and percentage distribution of nurses according to their characteristics (n=240)

Nurses' characteristics	N	%
Age in years		
20: < 30	110	**45.9**
30: < 40	86	**35.8**
≥ 40	44	18.3
Mean±SD. **28.55±7.57**		
Gender		
Male	57	23.8
Female	183	**76.2**
Residence		
Urban	52	21.7
Rural	188	**78.3**
Educational level		
Diploma of Nursing	45	18.7
Technical Nursing Institute	100	**41.7**
Bachelors in nursing science	55	**22.9**
Postgraduate studies	40	16.7
Experience in pediatric nursing (years)		
< 10	101	**42.1**
10: < 20	109	**45.4**
≥ 20	30	12.5
Working unit		
Critical unit	152	**63.3**
Noncritical unit	88	36.7
Experience with the current EHRs system		
< 6 months	110	**45.8**
6 months: < 1 year	130	**54.2**
Have you attended any previous training programs related to EHRs?		
Yes	50	20.8
No	190	**79.2**
If yes, how many courses did you take? (n=50)		
One time	45	**90**
Two time	5	10

Figure (1): Percentage distribution of nurses' perspective on their proficiency in using computer applications and concepts (N= 240).

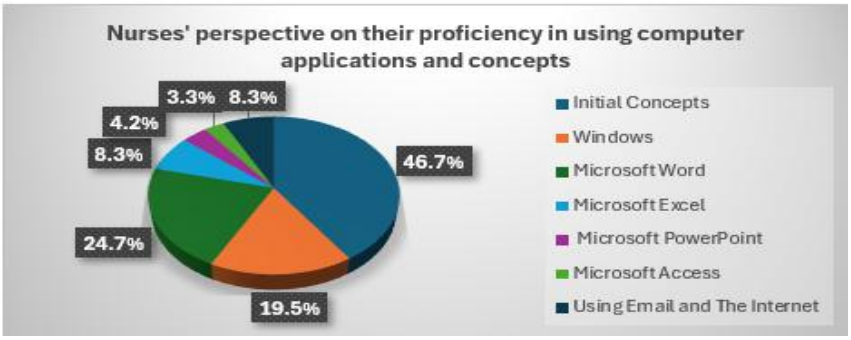

Table (2): Frequency and percentage distribution of nurses' perspectives regarding challenges hindering EHRs integration and use pre-intervention (N= 240).

Challenges dimensions	High		Moderate		Low	
	N	%	N	%	N	%
Technical obstacles						
Lack of EHR knowledge	191	79.6	32	13.3	17	7.1
Lack of technical training	178	74.2	39	16.2	23	9.6
Lack of technical support	178	74.2	44	18.3	18	7.5
Complexity of the system	185	77.1	31	12.9	24	10
Limitations of the system	191	79.6	38	15.8	11	4.6
Limited internet access in the workplace	181	75.5	30	12.5	29	12
Lack of computer skills	189	78.8	35	14.6	16	6.6
Electric power interruption	207	86.2	11	4.6	22	9.2
Total	185	**77.1**	35	14.6	20	8.3
Financial obstacles						
Initial high expenses	208	86.7	13	5.4	19	7.9
High ongoing expenses	190	79.2	17	7.1	33	13.7
Total	199	**82.9**	15	6.3	26	10.8
Psychological obstacles						
Lack of confidence in EHRs	205	85.4	10	4.2	25	10.4
Worries about privacy and security	186	77.5	24	10	30	12.5
Lack of willingness	195	81.2	23	9.6	22	9.2
Desires for performance	192	80	10	4.2	38	15.8
Desires for effort	177	73.8	28	11.6	35	14.6
Total	191	**79.6**	19	7.9	30	12.5
Organizational Obstacles						
Lack of an incentive scheme for healthcare providers	210	87.5	10	4.2	20	8.3
Lack of leadership	173	72.1	25	10.4	42	17.5
Lack of management support	169	70.4	40	16.7	31	12.9
Organizational culture toward EHRs	190	79.2	35	14.6	15	6.2
Total	179	**74.6**	30	12.5	31	12.9
Time obstacles						
The application of EHRs needs more time than expected	187	77.9	18	7.5	35	14.6
Time on the system learning	174	72.5	26	10.8	40	16.7
Time of data entry	185	77.1	10	4.2	45	18.7
Total	182	**75.8**	18	7.5	40	16.7
Social obstacles						
Uncertainty about suppliers	172	71.7	30	12.5	38	15.8
Interference with nurse-patient interaction	140	58.4	50	20.8	50	20.8
Total	156	**65**	40	16.7	44	18.3
Total nurses' perspective regarding challenges hindering EHRs integration and use	182	**75.8**	26	10.8	32	13.4

Table (3): Frequency and percentage distribution of nurses according to their level of satisfaction regarding EHRs use before intervention (N= 240).

Parameter	High level		Low level	
	N	%	N	%
I am happy with the system's performance speed.	27	11.3	213	**88.7**
I feel comfortable using the EHRs system.	36	15	204	**85**
I am satisfied with the adequate number of computers/laptops in my unit to access the EHRs system.	20	8.3	220	**91.7**
The system outage duration is acceptable.	23	9.5	217	**90.5**
I am satisfied with the technical support (IT experts) available for the EHRs system.	29	12	211	**88**
I am satisfied with the timing of the notice given regarding upgrading the EHRs system.	35	14.6	205	**85.4**
Overall, I am satisfied with the EHR system.	38	15.8	202	**84.2**
Total	36	15	204	**85**

Figure (2): Percentage distribution of nurses' total knowledge level regarding EHRs pre- and post-intervention (N= 240).

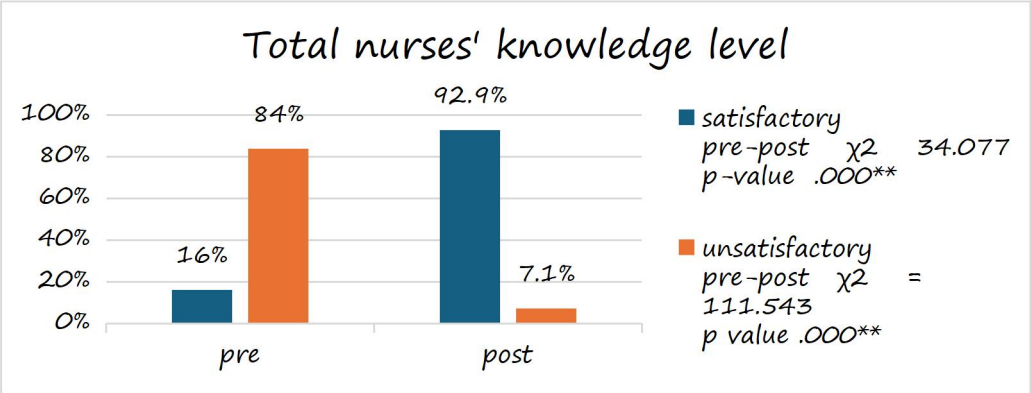

Table (4): Comparison of nurses' perception regarding EHRs pre- and post-intervention (N= 240).

Dimensions of Perception	Positive				Negative			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
Perception of the EHRs system	40	16.7	210	**87.5**	200	83.3	30	12.5
χ2 (P value)	**72.456 (.000)**				**19.107 (.000)**			
Perception of the effect of the EHRs system on pediatric patient care	33	13.8	215	**89.6**	207	86.2	25	10.4
χ2 (P value)	**187.872 (.000)**				**49.989 (.000)**			
Perception of the complexity of the EHRs system	54	22.5	210	**87.5**	186	77.5	30	12.5
χ2 (P value)	**148.537 (.000)**				**61.895 (.000)**			
Perception of the impact of the EHRs system on personal work	25	10.4	209	**87.1**	215	89.6	31	12.9
χ2 (P value)	**178.125 (.000)**				**116.265 (.000)**			
Perception of usefulness	45	18.7	208	**86.7**	195	81.3	32	13.3
χ2 (P value)	**180.678 (.000)**				**113.205 (.000)**			
Perception of training needs	59	24.6	210	**87.5**	181	75.4	30	12.5
χ2 (P value)	**177.278 (.000)**				**110.345 (.000)**			
Total perception	43	18	216	**90**	197	82	24	10
χ2 (P value)	**111.765 (.000)**				**105.231 (.000)**			

Table (5): Correlation between nurses' total satisfaction regarding the integration of EHRs and their knowledge, perception pre-intervention

Spearman rank correlation		Total satisfaction pre-intervention
Total knowledge of HER at pre-intervention	r	0.197
	P-value	0.000**
Total perception of HER at pre-intervention	r	0.174
	P-value	0.000*

Table (6): Correlation between nurses' knowledge and perceptions regarding integrating EHRs in healthcare for pediatric patients (N= 240).

Spearman rank correlation		Total knowledge of EHRs
Total perception of HER	r	0.82
	P-value	0.001*

Discussion

Pediatric nursing is no exception to the recent trend of technology being an essential part of the healthcare ecosystem in recent years. Healthcare professionals' approaches to child patient care, diagnosis, and therapy have been completely transformed by the use of modern technology. Patient outcomes, healthcare delivery, and the general experience for families and healthcare professionals have all significantly improved as a result of this trend. The use of EHRs is one of the revolutionary developments in pediatric nursing **(Ahamad, 2023)**. Therefore, the objectives of the study were evaluating pediatric nurses' readiness regarding the integration of EHRs in health care, identifying their satisfaction level and challenges that hinder the effective integration and use of EHRs, then evaluating the effect of educational intervention on pediatric nurses' knowledge and perceptions regarding EHRs in health care for pediatric patients.

The study results provide valuable insights into the characteristics of the nursing workforce and their experience with EHRs. It showed that a significant portion of nurses were relatively young, less than half aged between 20 - <30 years, and more than one-third aged between 30 - <40 years. more than three-quarters of the nurses were female and resided in rural areas, which was consistent with global trends in the nursing profession. The researchers view that the nursing workforce is mainly young in this study, with many nurses aged 20 to 30 and a significant number aged 30 to 40. Younger nurses were usually more adaptable to technology like EHRs. The workforce was mostly female, reflecting global trends, and many nurses live in rural areas, which could impact healthcare delivery and EHR system integration. The **World Health Organization (WHO), (2020)** also highlighted that nursing was a predominantly female profession.

Less than half of nurses had completed education at a technical nursing institute, and less than a quarter possessed a bachelor's degree in nursing science. Less than a quarter had a bachelor's degree, which had significant implications for the integration of EHRs. Education level was a critical predictor of nurses' ability to effectively adopt and integrate EHR systems into their daily workflow. Higher education was associated with greater proficiency in dealing with these systems. Also, less than half of nurses with 10 to < 20 years of experience in pediatric nursing. Followed by more than two-fifths of nurses with less than 10 years of experience. This mix of experience levels could be beneficial for knowledge transfer within the team.

Less than two-thirds of nurses worked in critical care units, and more than half had 6 months to less than 1 year of experience with the current EHRs system. This suggested that the EHRs system might be relatively new, and many nurses were still in the early stages of adapting to the system, so ongoing support and training could be crucial for effective utilization. About four-fifths of nurses did not attend any previous training programs related to EHRs; among those who had attended such programs, most had only taken one course. This highlighted a significant gap in training, which was critical for effective EHRs implementation. So, there was a need for EHRs training programs to ensure a more widespread and in-depth understanding of EHRs among nurses.

The study findings revealed that less than half of the nurses reported having a foundational understanding of computer concepts, and only less than one-quarter of them considered themselves to have proficiency in specific computer applications. So, there is a clear need for targeted training programs to improve their proficiency in certain software applications and enhance their overall computer skills. This would not only improve their technical skills but also increase their confidence and efficiency in various professional tasks. This is aligned with **Farzandipour et al., (2020)** findings regarding nurses' basic computer competencies, including having the knowledge and ability to use computers, less than half of them reported high competence in basic computer skills. Also, the **Habibi-Koolaee et al., (2015)** study analysis of participants' computer skills revealed that Microsoft Word had the highest ICDL skill level. The majority of nurses were the least proficient in Microsoft Access.

The present study found that more than three-quarters of nurses reported high levels of

technical obstacles hindering EHRs integration and use, such as lack of knowledge, technical training and technical support, complexity of the system, limitation of the system, lack of EHR knowledge, limited internet access in the workplace, and lack of computer skills. The most frequent obstacles to Electronic Medical Record (EMR) adoption, according to a related study in Ethiopia by **Yehualashet et al., (2021)**, were a lack of EMR training, limited computer access, low computer literacy, a lack of technical support, a lack of EMR knowledge, and the absence of an EMR manual. Additionally, the research by **Alsohime et al., (2019)** found that hardware, a time-consuming data input method, and a lack of information technology (IT) assistance are major obstacles to the appropriate use of EHR for pediatric healthcare services.

Financial obstacles, more than four-fifths of nurses reported that the highest percentage of high-level obstacles was related to financial issues. This suggested that budget constraints and the cost of implementing and maintaining EHR systems were significant concerns. Likewise, a recent study conducted by **Dayama et al., (2024)** examined the financial performance of high Medicaid nursing homes following the implementation of EHRs systems. The study found that financial concerns were a significant obstacle to wider EHRs implementation. The costs associated with EHRs systems include hardware, data migration, training, IT support, and ongoing maintenance. This study supported the observation that financial issues were a major barrier to the successful implementation and maintenance of EHRs systems in healthcare settings.

Psychological obstacles, more than three-quarters of nurses reported high psychological obstacles, including (Lack of confidence in EHRs, worries about privacy and security, lack of willingness, and desires for performance and effort). This could be due to stress, resistance to change, or lack of confidence in using the system. Consistent with the Saudi Arabian study, **Al-Otaybi et al., (2022)** identified security and privacy issues as the primary EHR obstacles causing dissatisfaction among staff. A study published by **El-Yafouri et al., (2022)** examined the psychological, social, and technical factors influencing the adoption of EMR systems by physicians in the United States. The study found that psychological obstacles, such as a lack of belief in the benefits of EMRs, privacy and security concerns, and a lack of willingness to adopt new technology, significantly hindered the integration and use of EMR systems. According to research by **Strudwick et al., (2018),** nurses at the study location encountered difficulties with the EHR, especially regarding functionality, effort associated with documentation, and system efficiency. Another study published by **Cifuentes et al., (2015)** highlighted the challenges faced by practices integrating behavioral health and primary care using EHR systems. The study identified psychological barriers, including performance expectancy and effort expectancy, as major obstacles to successful EHR integration.

Organizational obstacles: High levels of organizational obstacles were reported by around three-quarters of nurses. This pointed to issues within the healthcare organization, such as a lack of incentive schemes for healthcare providers, a lack of leadership, a lack of management support, and an organizational culture. These findings aligned with **Provenzano et al., (2024),** a recent study, which found that organizational issues were significant barriers to the successful implementation and use of EHRs systems.

Time-related obstacles were reported by more than three-quarters of nurses regarding the application of EHRs, needing more time than expected to learn the system, and to enter data/information. This could be due to the system being time-consuming or adding to the nurses' workload. Likewise, less than two-thirds of nurses reported high levels of social obstacles that hinder the integration and use of EHRs, such as uncertainty about suppliers and interference with nurse-patient interaction. As well, agreement with a recent study of **Provenzano et al., (2024)** that looked at increasing workload and time demands and found that the implementation of EHRs initially raised healthcare staff workload and time demands. Reduced time for direct care of patients and an overall rise in administrative costs were common issues mentioned by participants. Also, nurses reported that EHR systems often interfered with their ability to maintain direct and meaningful interactions with patients.

The findings about social obstacles to EHRs point to two major issues: supplier uncertainty and interference with nurse-patient

communication. More than two-thirds of nurses experienced uncertainty about suppliers, which could lead to mistrust in the EHR system itself, affecting its adoption and effective use. More than half of nurses reported that EHRs interfere with nurse-patient interaction. This is a significant concern as it directly impacts the quality of care and patient satisfaction. These findings aligned with a study published by **Forde-Johnston et al., (2022)** to explore how nurses' use of EHRs impacted the quality of nurse-patient interactions and communication. The review found that EHRs often impede face-to-face communication and affect communication patterns.

Overall Challenges: The total percentage of nurses reported high levels of obstacles across all dimensions were more than three-quarters, underscoring the widespread and multifaceted nature of the challenges hindering EHRs integration and use, which confirmed research hypothesis 1. Therefore, the managers and other stakeholders in healthcare organizations should be aware of these barriers that impede EMR implementation. By tackling these challenges, healthcare organizations could improve the integration and use of EHRs system, ultimately enhancing the quality of patient care.

Concerning nurses' satisfaction level regarding EHRs integration and use, this study illuminated low satisfaction percentages of nurses across different parameters that confirmed research hypothesis 1 and indicated systemic issues that need addressing to improve their overall experience and efficiency. This low level of satisfaction among nurses might stem from challenges facing them in the integration of EHRs, such as a lack of knowledge, inadequate training, and insufficient technical support, which impact their efficiency and patient care quality. This findings aligned with those of prior research that confirmed that staff satisfaction with EHR use is correlated with adequate training Likewise, **Alsohime et al., (2019)** showed that the participants' satisfaction scores were 5.2/10 and came to the conclusion that more research is necessary to determine the factors influencing the EHR system's satisfaction levels across various healthcare institutions because there was little available information about EHR implementation and end-user satisfaction in the Middle East. In contrast, the item analysis for the satisfaction domain was discovered by **Ramoo et al., (2023)**. The vast majority of nurses stated that they are happy with the timing of notices regarding EMR system changes, feel comfortable using the EMR system, and are satisfied with the availability of dependable technical support. Nonetheless, around half of the nurses expressed dissatisfaction with the system's outage duration and performance speed.

Nurses' readiness in this study was determined by their knowledge and perception. Concerning nurses' knowledge regarding EHRs, most nurses had satisfactory knowledge regarding EHRs (definition, importance, components, advantages, and challenges) post-intervention, compared to less than one-fifth of them pre-intervention, with a statistically significant difference between the two study phases that confirmed research hypothesis 2. This shows that the study intervention was successful in improving nurses' knowledge regarding EHRs. This result was in line with a study by **Musa et al., (2023)**, which noted that almost all of the participants had good overall knowledge scores after the intervention, compared to more than two-fifths before. Similarly, less than one quarter of research participants had adequate knowledge about electronic health records (EHRs) at the pre-program phase, but by the post-program phase, that number rose to 90%. This was demonstrated in the **Mahfouz et al., (2023)** study. Furthermore, **Abo Gad & Abou Ramadan, (2018)** conducted a study at Tanta International Teaching Hospital revealed that post-program, the study group's mean scores improved across all knowledge dimensions (importance, components, function, and barriers), with statistically significant differences before and after the program ($p \leq 0.05$). However, the control group's knowledge mean scores remained unchanged with no statistical differences. Contrariwise, the study of **Mu'awiyyah et al., (2021)**, investigated the knowledge, attitude, and perception of healthcare personnel on the use of EMRs and discovered that more than one-third of respondents had good knowledge of EMR, while less than half had fair knowledge.

The current study also looked at the impact of intervention on nurses' perceptions regarding EHRs**.** The intervention had a profound positive impact across various dimensions of nurses' perceptions of EHRs, and most nurses had a positive perception in post-intervention regarding

the total perception of EHRs compared to less than one-fifth in pre-intervention, which confirmed research hypothesis 2. The statistically significant changes suggested that the intervention effectively addressed initial concerns and improved the overall acceptance and perceived benefits of EHRs among nurses. This highlighted the importance of targeted training and support in facilitating the adoption of new technologies in healthcare settings. This finding was consistent with previous studies. In **Alturki (2017)** study, nurses indicated a negative perception of the EMR system, likely as a result of their lack of knowledge and mistrust of its use. Moreover, a significant majority of nurses in this study stated that the EMR system's dispersed records caused delays in the delivery of patient care, while manual records were easier to maintain and retrieve. according to a **Jathanna (2017)** study, the EMR system was viewed negatively by nurses in a 2032-bed hospital in India. This was because the system lacked several nursing-focused features and required laborious documentation across numerous tabs or web pages.

The study result indicated a positive correlation between nurses' total satisfaction regarding the integration of EHRs and their knowledge and perception of EHRs before an intervention. suggesting that having more knowledge and a positive perception of EHRs was associated with higher satisfaction levels among nurses. Therefore, to improve nurse satisfaction with EHRs, healthcare organizations should focus on providing comprehensive training and fostering a positive perception of EHRs. These outcomes were in line with **Ramoo et al., (2023),** who revealed a significant and moderate positive relationship between perception and satisfaction, $r = .495, p < .001$. This suggested that nurses were more satisfied when they had a higher positive perception of the EMR system. Also, the study of **Asiri (2024)** examined factors affecting EHR workflow integration among nurses in Saudi Arabia and found a positive correlation between nurses' perception and satisfaction

The study findings suggested a positive correlation between the two variables. This means that nurses' knowledge of EHRs increases their perceptions of the integration of EHRs in pediatric healthcare, and also improves significantly, which confirms research hypothesis 3. These results were consistent with a recent Egyptian study by **Hendy et al., (2025),** which found that nurses' acceptance of EHRs was significantly influenced by their level of knowledge. These results highlighted the significance of focused education and skill learning programs in helping to facilitate the successful implementation of EHR systems in the healthcare sector.

Conclusion:

Based on the results of the study, there were several significant challenges that nurses faced regarding the integration and use of EHRs before intervention. Also, the majority of nurses were unsatisfied with various aspects of the electronic health records system prior to intervention. Furthermore, most nurses were found to have satisfactory knowledge regarding EHRs and a positive perception post-intervention regarding the EHRs system compared to less than one-fifth pre-intervention. In addition, the study findings underscore the critical role of knowledge in shaping nurses' perceptions towards EHRs, there was a positive correlation between nurses' knowledge of EHRs and their perceptions regarding the integration of EHRs in healthcare for pediatric patients.

Recommendations:

Based on the conclusions, the researchers recommend that:

1. More EHRs system training is recommended to improve satisfaction among pediatric nurses who are not familiar with the system.
2. Administrations at nursing colleges are urged to integrate EHRs system training into nursing courses in order to better prepare future nurses for the technology-driven healthcare practices of today.
3. Addressing EHRs integration obstacles requires a comprehensive approach that includes technical improvements, financial investment, psychological support, organizational changes, time management strategies, and social interventions.
4. The educational programs and continuous training of healthcare professionals facilitate smoother implementation and greater

acceptance of EHR systems in healthcare settings.

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