

Training, usability, and technical support as predictors of electronic health record–associated workflow efficiency and job satisfaction among nurses: evidence from Palestine

Capacitación, usabilidad y soporte técnico como predictores de la eficiencia del flujo de trabajo asociada a la historia clínica electrónica y la satisfacción laboral entre enfermeros: evidencia desde Palestina

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ABSTRACT

Introduction: electronic health records (EHRs) have transformed healthcare documentation, yet their impact on nursing practices in resource-limited settings remains underexplored. In Palestine, where governmental hospitals face infrastructure challenges, EHR adoption may enhance efficiency but also introduce disruptions affecting nurse morale.

Objective: to assess the dual role of electronic health information systems in nursing practice: perceived benefits and challenges for workflow and job satisfaction in Palestine

Method: this quantitative cross-sectional study surveyed 190 nurses from medical and surgical wards in eight Palestinian governmental hospitals using a structured questionnaire. Data collection occurred from March to April 2025. The instrument assessed demographics, work environment factors, workflow efficiency (9-item Likert scale), and job satisfaction (adapted Nursing Workplace Satisfaction Questionnaire, 10 items). Sample size was calculated via G*Power for regression analysis (n=190 minimum). Descriptive statistics, normality tests, and multiple linear regression were performed using SPSS version 29, with significance at p<0,05.

Results: response rate was 90,48 %. Nurses (mean age 32,64 years; 51,6 % male) reported moderate workflow efficiency (mean=3,59/5) and job satisfaction (mean=3,57/5). Over 70 % perceived high EHR-related efficiency, with 52,1 % satisfied overall. Regression identified EHR user-friendliness ($\beta=0,261$, p<0,001), training ($\beta=0,243$, p=0,024), technical support ($\beta=0,184$, p=0,005), and age ($\beta=0,223$, p=0,037) as predictors of efficiency. Similar factors predicted satisfaction: user-friendliness ($\beta=0,274$, p<0,001), training ($\beta=0,274$, p=0,020), technical support ($\beta=0,148$, p=0,012), and age ($\beta=0,194$, p=0,045).

Conclusions: EHRs positively influence nursing productivity and moderately boost fulfillment in Palestinian public hospitals, contingent on training and support. Findings inform policy for optimizing digital tools in low-resource contexts to improve care quality and reduce burnout.

Keywords: Electronic Health Records; Nursing Workflow; Job Satisfaction; Nurses; Health Informatics; Palestine.

RESUMEN

Introducción: las historias clínicas electrónicas (HCE) han transformado la documentación sanitaria; sin embargo, su impacto en las prácticas de enfermería en entornos con recursos limitados sigue sin estar suficientemente estudiado. En Palestina, donde los hospitales públicos se enfrentan a dificultades de infraestructura, la adopción de las HCE puede mejorar la eficiencia, pero también generar trastornos que afecten la moral del personal de enfermería.

Objetivo: evaluar el doble papel de los sistemas de información de salud electrónicos en la práctica de enfermería: beneficios percibidos y desafíos para el flujo de trabajo y la satisfacción laboral en Palestina

Método: este estudio cuantitativo transversal encuestó a 190 enfermeras de salas médicas y quirúrgicas en ocho hospitales gubernamentales palestinos utilizando un cuestionario estructurado. La recopilación de datos se realizó de marzo a abril de 2025. El instrumento evaluó datos demográficos, factores del entorno laboral, la eficiencia del flujo de trabajo (escala de Likert de 9 ítems) y la satisfacción laboral (Cuestionario de Satisfacción en el Lugar de Trabajo de Enfermería adaptado, 10 ítems). El tamaño de la muestra se calculó mediante G*Power para el análisis de regresión (n = 190 como mínimo). Se realizaron estadísticas descriptivas, pruebas de normalidad y regresión lineal múltiple utilizando SPSS versión 29, con un nivel de significación de p < 0,05.

Resultados: la tasa de respuesta fue del 90,48 %. Las enfermeras (edad media de 32,64 años; 51,6 % hombres) informaron de una eficiencia moderada en el flujo de trabajo (media = 3,59/5) y de una satisfacción laboral moderada (media = 3,57/5). Más del 70 % percibió una alta eficiencia relacionada con la HCE, y el 52,1 % se mostró satisfecho en general. La regresión identificó la facilidad de uso del EHR ($\beta = 0,261$, $p < 0,001$), la capacitación ($\beta = 0,243$, $p = 0,024$), el soporte técnico ($\beta = 0,184$, $p = 0,005$) y la edad ($\beta = 0,223$, $p = 0,037$) como predictores de la eficiencia. Factores similares predijeron la satisfacción: facilidad de uso ($\beta = 0,274$, $p < 0,001$), capacitación ($\beta = 0,274$, $p = 0,020$), soporte técnico ($\beta = 0,148$, $p = 0,012$) y edad ($\beta = 0,194$, $p = 0,045$).

Conclusiones: los EHR influyen positivamente en la productividad de enfermería y aumentan moderadamente la satisfacción en los hospitales públicos palestinos, dependiendo de la capacitación y el soporte. Los hallazgos sirven de base para políticas destinadas a optimizar las herramientas digitales en contextos de bajos recursos con el fin de mejorar la calidad de la atención y reducir el agotamiento.

Palabras claves: Registros Electrónicos de Salud; Flujo de Trabajo de Enfermería; Satisfacción Laboral; Enfermeros; Informática en Salud; Palestina.

INTRODUCTION

Electronic Medical Records (EHRs) are digital versions of patients' medical records designed to facilitate the systematic storage, retrieval, and management of health information through computerized systems.⁽¹⁾ Since their initial development in the 20th century, EHRs have evolved into comprehensive systems that support clinical documentation, decision-making, and coordination of care. By improving accessibility to accurate and timely patient information, EHRs have the potential to enhance patient safety, quality of care, and clinical outcomes through reduced medication errors, decreased duplication of tests, and improved communication among healthcare professionals.^(2,3)

For nurses, EHRs play a central role in daily clinical practice, as documentation constitutes a substantial proportion of nursing work. Evidence suggests that EHR use can reduce the time nurses spend on documentation, improve record legibility and completeness, and allow real-time access to patient data across clinical settings.⁽⁴⁾ Despite these advantages, EHR implementation may also introduce challenges related to system usability, excessive documentation requirements, and workflow disruptions, which can negatively influence nurses' efficiency and job satisfaction if not adequately addressed.⁽¹⁾

Work satisfaction is defined as a positive emotional state resulting from the appraisal of one's job experiences. Nurses' satisfaction is influenced by multiple factors, including education level, professional experience, workload, staffing adequacy, availability of resources, interpersonal relationships, workplace violence, and psychological stressors such as anxiety and fear.⁽²⁾ Dissatisfaction among nurses has been associated with adverse mental and physical health outcomes, including stress, burnout, depression, and anxiety, as well as decreased quality and safety of patient care.⁽⁵⁾

Documentation systems play a critical role in shaping nursing workflow. Accurate and effective documentation supports continuity of care, patient safety, and professional accountability, while also influencing nurses' time management, productivity, and work satisfaction.^(6,7) However, nurses often express resistance to new technologies due to concerns that electronic systems may disrupt established routines and increase workload. Poorly designed EHR systems have been linked to communication breakdowns, workflow inefficiencies, higher error rates, and increased stress and exhaustion among nurses.^(8,9) Excessive documentation demands further contribute to burnout and job dissatisfaction, exacerbating the global shortage of nursing professionals.⁽¹⁰⁾

International evidence highlights both the benefits and challenges of EHR implementation. In developed countries, EHRs have improved access to patient data and supported clinical decision-making, yet issues related to system complexity and documentation burden persist.⁽¹¹⁾ In developing countries, factors such as limited infrastructure, inadequate training, and insufficient technical support significantly influence workflow efficiency and user satisfaction.^(12,13) In the Middle East, variation in EHR adoption remains evident, with nurses reporting challenges related to usability, training, and increased documentation workload, which negatively affect workflow and satisfaction.^(14,15)

To guide this investigation, we draw upon the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT posits that performance expectancy (perceived usefulness), effort expectancy (perceived ease of use), social influence, and facilitating conditions (e.g., training and technical support) are key determinants of technology acceptance and subsequent behavioral outcomes.⁽¹⁶⁾ In the context of EHRs, this framework helps explain how user friendliness (effort expectancy), training and technical support (facilitating conditions), and perceived workflow benefits (performance expectancy) may directly influence nurses' workflow efficiency and job satisfaction. Previous nursing informatics studies have successfully applied UTAUT to predict EHR satisfaction and adoption, making it a suitable theoretical lens for the Palestinian hospital setting.

In Palestine, the healthcare system faces unique challenges related to political and economic instability, resulting in resource constraints, staffing shortages, and reliance on outdated or fragmented documentation systems.^(17,18,19) These conditions increase nurses' workloads, disrupt workflow, and contribute to dissatisfaction and stress. Despite growing international literature on the impact of EHRs on nursing practice, limited research has examined their influence on workflow efficiency and work satisfaction among nurses in Palestinian governmental hospitals. This lack of local evidence represents a significant gap, limiting the ability of healthcare leaders and policymakers to implement context-specific, evidence-based improvements in documentation practices. A recent single centre study in Palestine reported moderate work satisfaction with EHRs, but did not examine workflow efficiency or the combined effect of training and technical support.⁽²⁰⁾ Park et al.⁽²¹⁾ systematically reviewed 21 studies on nurses' perceptions of EHR usability, noting that most studies focus on performance, while few measure safety outcomes or systematically address all

three human factor goals (satisfaction, performance, safety). Therefore, this study aims to assess the influence of electronic medical record systems on workflow efficiency and work satisfaction among nurses working in medical and surgical wards in governmental hospitals in Palestine.

METHOD

Design and Settings

This study employed a quantitative, cross-sectional design to examine the influence of EHR systems on nurses' work satisfaction and workflow efficiency. This study was conducted in Palestine, which is home to numerous governmental and non-governmental hospitals. Governmental hospitals with medical, surgical, or day care departments were included.

Population

Nurses working in the medical and surgical departments of governmental hospitals in Palestine were the target population. The accessible population comprised nurses working in medical and surgical wards at selected governmental hospitals in Palestine.

Sample and Sampling

The sample size for this study was determined using G*Power 3,1 software, which is appropriate for regression analysis. The minimum required sample size was calculated to be 190 participants. To account for potential dropouts and statistical errors, the sample size was increased to 210.

The sampling method used in this study is non-probability convenience sampling. This approach was chosen due to the ease of access to participants and the ability to include a diverse group of nurses working different shifts in medical and surgical departments. Convenience sampling is particularly suitable for this study as it allows for efficient data collection from a broad range of participants who are readily available and willing to participate, ensuring the study can be completed within the given time frame.

Inclusion and Exclusion Criteria

Inclusion criteria

- Registered nurses (RNs) or licensed practical nurses (LPNs) with at least 3 months of experience using the EHR system in their current governmental hospital. This period allows nurses to move from basic competence to routine, integrated use of the system, reducing the confounding influence of early stage learning effects on perceptions of workflow efficiency and job satisfaction.
- Nurses who previously worked with paper-based system for at least 3 months before using EHR system.
- Nurse currently working in Medical and surgical Wards.

Exclusion Criteria

- Nurses working in wards where a mixed documentation (combination of paper-based and electronic based)
- Administrative or Supervisors staff who not involved in direct patient care and documentation
- Nurses who refuse participate or do not complete the survey.

Instrumentation

A structured self-reported questionnaire was used for data collection. The questionnaire consisted of three main sections. The first section focused on assessing demographic and environmental variables. The second section of the instrument is designed to measure nurses' perceptions of workflow efficiency when using EHR systems. It includes 9 statements distributed across five key domains: Access to Patient Information, Time Management, Interruptions and Distractions, Coordination of Care, and Tracking Patient Progress. The workflow efficiency tool was developed by the research team based on a comprehensive review of the literature. It consists of 9 items distributed across five domains: Access to Patient Information, Time Management, Interruptions and Distractions, Coordination of Care, and Tracking Patient Progress. No existing validated tool was identified that measures EHR-specific workflow efficiency across these domains in low-resource settings. Therefore, this instrument was created for the present study. Formal construct validation (e.g., exploratory factor analysis) was not conducted. However, content validity was established by a panel of five nursing informatics experts, and internal consistency was high (Cronbach's $\alpha = 0,904$).

The third section assessed the satisfaction level when using EHRs by using an a daptive Nursing Workplace Satisfaction Questionnaire (NWSQ). Measures work satisfaction among nurses across three domains: intrinsic, extrinsic and relational satisfaction.

Validity and Reliability

Content Validity Index (CVI) of the questionnaire was assessed by highly experienced research professors and experts in the field, based on their feedback necessary modifications on the questionnaire it modified, after the modification the questionnaire was re-evaluated to ensure the validity. Due to incomplete documentation of individual expert ratings, exact ICVI and SCVI values cannot be reported. However, all five experts qualitatively agreed that the items were relevant and representative, and no item was rated as 'not relevant' by more than one expert. To measure the clarity, understandability, and feasibility of the questionnaire, a pilot study was conducted with a sample of 25 nurses working in medical and surgical wards at Palestinian governmental hospitals. Adjustments were made based on pilot study feedback. The nurses who participated in the pilot study were excluded from the actual

study to prevent any potential bias or contamination. No items were removed from either scale as a result of the pilot study. The results showed good reliability for the workflow efficiency scale (Cronbach's $\alpha = 0,904$) and the work satisfaction scale (Cronbach's $\alpha = 0,907$).

Data Collection Process

After obtaining essential ethical approval, meetings arranged with head nurses in each ward in the selected hospitals to explain the purpose of the study and request a list of the unit participants characteristics and their experiences, as well as obtaining access to medical and surgical nurses who are eligible to participate in the study. The agreed participants asked to sign informed consent and complete the questionnaire; to avoid loss of the questionnaires, the researchers collected the questionnaires at the end of each working day. The structured self-reported questionnaire was used to collect data during the period of March–April 2025 at the selected hospitals.

Data Analysis

Data analysis was conducted using SPSS version 29. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, summarized demographic variables and survey responses. Multiple linear regression analysis identified significant predictors of workflow efficiency and work satisfaction, providing insights into the influence of demographic and environmental variables. The statistical significance was set at $P < 0,05$ for all analyses.

Ethical Consideration

Ethical approval to conduct the study was obtained from the Ethical Committee of Palestine Polytechnic University. A support letter was obtained from the selected hospitals before commencing data collection. All participants signed consent form before participation. Also, rapport was established and individuals informed about the voluntary nature of their participation. Privacy and participants' personal information was protected and assured. Written informed consent was obtained from all participants prior to their involvement in the study. The study adhered to the ethical standards outlined in the Declaration of Helsinki regarding the rights, safety, and well-being of research participants.

RESULTS

Table 1. Distribution of Socio-demographics among Nursing (N =190)

Socio-demographics	n	%
Age		
(<i>M ± SD</i>)	(32,6421 ± 7,3072)	
20-30	97	51,1
31-40	66	34,7
41-50	21	11,1
More than 50	6	3,2
Gender		
Male	98	51,6
Female	92	48,4
Working schedule shifts		
A	56	29,5
BC	31	16,3
ABC	103	54,2
Training on EHR		
Yes	125	65,8
No	65	34,2

Note: ABC = rotating shifts covering all three shift types (morning, evening, and night); BC = rotating shifts covering only evening and night shifts; A = morning shifts only. Morning shift (typically 7:00–15:00), evening shift (15:00–23:00), night shift (23:00–7:00).*

The questionnaires were distributed over 210 nurses and the feedbacked questionnaires were 190 with response rate 90,48 %. Table 1 showed Socio-demographic analysis which demonstrates that about half of the nurses were in the age group of 20–30 years (51,1 %), with a mean age of 32,64 years ($SD = 7,31$). Gender was almost equal, males (51,6 %) and females (48,4 %). More than half of the nurses worked ABC shift (54,2 %). Training in EHR was available for 65,8 %, which might have had influence on both workflow and satisfaction.

The Influence of EHR on Workflow Efficiency

Analysis of workflow efficiency domains revealed that nurses perceived the use of electronic medical records (EHRs) to have a moderate to high positive influence on their workflow. The highest mean scores were observed in the domains of time management, coordination of care, and accuracy of documentation (each $M = 3,66$), indicating that nurses generally agreed that EHRs improved efficiency in these areas. Similarly, tracking patient progress ($M = 3,65$) and access to patient information ($M = 3,62$) were rated favorably, reflecting improved accessibility and monitoring of patient data. In contrast, the domain of interruptions and distractions received the lowest mean score ($M = 3,39$), suggesting more neutral perceptions and highlighting ongoing challenges related to workflow interruptions and technical issues during EHR use. Overall, the combined workflow efficiency score ($M = 3,60 \pm 0,75$) indicates that EHR systems moderately to highly support nursing workflow efficiency in governmental hospitals (table 2).

Table 2. Workflow Efficiency Domains Related to EHR Use (N = 190)

Domain	Mean $\pm$ SD	Interpretation
Access to patient information	3,62 $\pm$ 1,15	Moderate–high
Time management	3,66 $\pm$ 1,07	Moderate–high
Interruptions and distractions	3,39 $\pm$ 0,81	Moderate
Coordination of care	3,66 $\pm$ 0,88	Moderate–high
Tracking patient progress	3,65 $\pm$ 0,84	Moderate–high
Accuracy of documentation	3,66 $\pm$ 1,05	Moderate–high
Overall workflow efficiency	3,60 $\pm$ 0,75	Moderate–high

Note: Scores were measured on a 5-point Likert scale, with higher scores indicating more positive perceptions of workflow efficiency.

Factors Influencing Nurses' Perceptions of EHR's influence on Workflow Efficiency: Multiple Linear Regression

A multiple linear regression analysis was conducted among to examine relationship between the demographic and work-environmental factors significantly predicted workflow efficiency scores. The overall model was statistically significant, and several predictors contributed meaningfully to the outcome.

Among the demographic variables, age was a significant predictor of workflow efficiency, $\beta = 0,223$, $t(df) = 2,102$, $p = 0,037$, indicating that higher age was associated with slightly improved efficiency. Training on the (EHR) system was also a significant predictor, $\beta = 0,243$, $t(df) = 2,281$, $p = 0,024$. In terms of work-environmental factors, user-friendliness of the EHR system had a highly significant positive relationship with workflow efficiency, $\beta = 0,261$, $t(df) = 4,678$, $p < 0,001$. Additionally, technical support satisfaction contributed positively to workflow efficiency, $\beta = 0,184$, $t(df) = 2,859$, $p = 0,005$.

Both training on EHR and user-friendliness of the system emerged as the strongest predictors of workflow efficiency, with standardized β values of 0,243 and 0,261 respectively. These findings indicate that improvements in either training or user interface design are associated with a substantial increase in workflow efficiency levels.

Conversely, factors such as gender ($\beta = -0,002$, $p = 0,982$), years of experience ($\beta = -0,088$, $p = 0,250$), primary shifts ($\beta = -0,029$, $p = 0,612$), and computer availability ($\beta = 0,082$, $p = 0,167$) demonstrated no statistically significant relationship with workflow efficiency (table 3).

Table 3. Predictors of workflow efficiency among nurses using EHR (N=190)

Variable	Std. β	SE	t	95 % Confidence interval		P-value
				Lower bound	Upper bound	
Age	0,223	0,106	2,102	0,432	0,328	0,037
Gender	-0,002	0,103	-0,023	0,200	0,887	0,982
Experience years	-0,088	0,076	-1,153	0,062	0,339	0,250
Primary Shifts	-0,029	0,058	-0,508	0,085	0,895	0,612
Training on EHR	0,243	0,106	2,281	0,453	0,921	0,024
User friendliness	0,261	0,056	4,678	0,371	0,686	<0,001
Technical support satisfaction	0,184	0,064	2,859	0,311	0,623	0,005
Computers availability	0,082	0,059	1,387	0,198	0,806	0,167

Note: B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; t = t-value; p = probability value.

Nurses' Work satisfaction with the use of the EHR

Analysis of work satisfaction domains indicated that nurses reported an overall moderate to high level of satisfaction with the

use of electronic medical record (EHR) systems ($M = 3,57 \pm 0,73$). Among the domains, intrinsic satisfaction recorded the highest mean score ($M = 3,60 \pm 0,74$), reflecting positive perceptions related to job meaningfulness, enthusiasm, personal accomplishment, and fulfillment when using EHRs. Relational satisfaction also demonstrated favorable results ($M = 3,56 \pm 0,73$), suggesting that nurses generally felt a sense of belonging and teamwork while using the EHR system. In contrast, extrinsic satisfaction showed a comparatively lower, yet still moderate, mean score ($M = 3,52 \pm 0,71$), indicating mixed perceptions regarding time availability, collegial support, opportunities for discussion, and learning in the context of EHR use. Overall, these findings suggest that while EHR systems are associated with positive intrinsic and relational aspects of work satisfaction, extrinsic factors related to workload and support may require further attention to enhance nurses' overall work experience (table 4).

Table 4. Work Satisfaction Domains Related to EHR Use (N = 190)		
Domain	Mean $\pm$ SD	Interpretation
Intrinsic satisfaction	3,60 $\pm$ 0,74	Moderate–high
Extrinsic satisfaction	3,52 $\pm$ 0,71	Moderate
Relational satisfaction	3,56 $\pm$ 0,73	Moderate–high
Overall work satisfaction	3,57 $\pm$ 0,73	Moderate–high
Note: Scores were measured on a 5-point Likert scale, with higher scores indicating greater work satisfaction. Negatively worded items were reverse scored prior to analysis.		

Predictors of Work Satisfaction among nurses using EHR

A multiple linear regression was conducted to examine whether demographic and work-environmental factors significantly predicted work satisfaction scores. The overall model was statistically significant, and several predictors contributed meaningfully to the outcome. Among the demographic variables, age was a significant predictor of work satisfaction, $\beta = 0,194$, $t(df) = 2,023$, $p = 0,045$, indicating that higher age was associated with higher satisfaction. Training on the (EHR) system was also a significant predictor, $\beta = 0,274$, $t(df) = 5,423$, $p = 0,020$. In terms of work-environmental factors, user-friendliness of the EHR system had a significant positive relationship with satisfaction, $\beta = .274$, $t(df) = 5,423$, $p < 0,001$. Additionally, technical support satisfaction contributed positively to work satisfaction, $\beta = 0,148$, $t(df) = 2,534$, $p = 0,012$. Both training on EHR and user-friendliness of the system were the strongest predictors of work satisfaction, with standardized β value of 0,274, indicating that improvements in either factor are associated with a substantial increase in satisfaction levels.

Table 5. Predictors of work satisfaction among nurses using EHR (N=190)						
Variable	β	SE	t	95 % Confidence interval		P-value
				Lower bound	Upper bound	
Age	0,194	0,096	2,023	0,005	0,384	0,045
Gender	-0,062	0,093	-0,670	-0,246	0,121	0,504
Experience years	-0,081	0,069	-1,183	-0,217	0,054	0,238
Primary Shifts	-0,094	0,053	-1,782	-0,197	0,010	0,076
Training on EHR	0,274	0,051	5,423	0,036	0,417	0,020
User friendliness	0,274	0,051	5,423	0,174	0,374	0,000
Technical support satisfaction	0,148	0,058	2,534	0,033	0,263	0,012
Computers availability	0,067	0,053	1,252	-0,038	0,172	0,212
Note: B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; t = t-value; p = probability value.						

DISCUSSION

This study examined the influence of electronic medical record (EHR) systems on workflow efficiency and work satisfaction among nurses working in governmental hospitals in Palestine. The study population was relatively young, with more than half of participants aged 20–30 years, and demonstrated near gender parity. Over half of the nurses worked rotating 24-hour ABC shifts, and approximately two-thirds had received formal EHR training. These characteristics provide important context for interpreting perceptions of EHR use, workflow efficiency, and satisfaction.

While all significant predictors had p values below 0,05, the standardized regression coefficients (β) ranged from 0,148 to 0,274, indicating small to moderate effect sizes. These magnitudes are consistent with exploratory studies in complex healthcare settings, where single factors rarely explain large portions of variance.

The predominance of younger nurses is consistent with workforce demographics in many developing countries, where younger professionals constitute the majority of clinical staff.⁽²²⁾ The balanced gender distribution reflects evolving gender roles in nursing and suggests that EHR adoption is unlikely to be strongly influenced by gender-related barriers.

The finding that 65,8 % of nurses received EHR training highlights the importance of capacity building in facilitating digital transformation. Training has been consistently identified as a cornerstone of successful EHR implementation, particularly in resource-limited settings. Nevertheless, despite relatively high training coverage, nurses reported only moderate satisfaction with system user-friendliness (53,2 %), technical support (45,2 %), and computer availability (41 %). In the Palestinian context, where nurses already face high workloads and stress, the absence of training likely exacerbates frustration and increases the risk of patient harm. Health policymakers should prioritize universal EHR training as a patient safety imperative, not merely an efficiency or satisfaction concern. These results underscore persistent environmental and infrastructural challenges that may limit the full potential of EHR systems in Palestinian hospitals.⁽²³⁾ Similar system-level barriers related to equipment readiness, organizational support, and technical preparedness have been reported in Palestinian emergency care settings, emphasizing the critical role of infrastructure and organizational enablers in optimizing clinical performance.⁽²⁴⁾

User-friendliness is a key determinant of system acceptance and sustained use. Moderate satisfaction in this domain suggests that while the EHR system addresses some clinical needs, notable usability issues remain, potentially hindering optimal workflow integration.⁽¹⁴⁾ Even more concerning is the low level of satisfaction with technical support, as inadequate IT assistance can prolong system disruptions, increase frustration, and negatively affect productivity.^(25,26) Limited computer availability further compounds these challenges by delaying documentation, increasing interruptions, and forcing nurses to adapt their workflow around system access constraints. Compared with resource-rich healthcare systems where infrastructure is well established, these findings highlight the structural limitations faced by Palestinian hospitals.^(27,28)

Despite these challenges, nurses generally associated EHRs with beneficial effects on workflow efficiency. More than 60 % of participants reported perceived improvements in access to patient information, documentation time, and coordination of care. However, due to the cross sectional design, these findings reflect associations, not causal effects. These findings align with existing literature demonstrating that EHRs facilitate timely access to comprehensive patient data, reduce reliance on paper records, and support clinical decision-making.⁽⁶⁾ Improved coordination and communication are particularly important in multidisciplinary hospital environments, where continuity of care depends on accurate and timely information exchange.⁽²⁹⁾

The Palestinian context poses unique infrastructural and political barriers to EHR effectiveness. First, checkpoints and travel restrictions between the West Bank's 11 governorates frequently delay technical support staff from reaching hospitals, prolonging system downtime. Second, unreliable electricity supply – with rolling blackouts affecting some governmental hospitals up to 8 hours daily – forces nurses to use backup generators or suspend EHR use, switching to paper records. Third, internet connectivity in many Palestinian hospitals is slow and unstable, causing delays in data synchronization and increasing interruptions (e.g., timeouts, lost entries). These factors are not merely background conditions; they directly affect the predictors we identified. For example, a nurse who cannot access the EHR due to an internet outage will perceive lower user friendliness and technical support satisfaction, regardless of the system's intrinsic design. Therefore, interventions to improve EHR efficiency in Palestine must address not only training and usability but also electricity, internet, and the logistical feasibility of IT support across checkpoints.

However, approximately half of the nurses reported frequent technical delays, such as system crashes and slow response times. This duality, simultaneous efficiency gains and technological disruptions, has been widely documented in EHR research.⁽²⁶⁾ While EHRs can streamline workflows, unresolved technical issues can negate these benefits by increasing interruptions, cognitive load, and dissatisfaction. In the Palestinian context, where infrastructure limitations are more pronounced, the reliability of EHR systems appears to be a critical determinant of their perceived value.

The overall workflow efficiency score ($M = 3,59$) and the high proportion of nurses reporting moderate to high efficiency indicate that EHRs are perceived as meaningfully improving nursing workflow, even amid infrastructural constraints. Our workflow efficiency findings are consistent with a recent study from Palestine that reported comparable efficiency gains.⁽³⁰⁾ These findings are comparable to studies conducted in Indonesia and Malaysia, which also reported improvements in workflow efficiency following EHR implementation^(2,8). Nonetheless, the persistence of technical challenges suggests that further gains in efficiency are possible through targeted system optimization and sustained organizational support.

Regression analysis identified age, EHR training, user-friendliness, and technical support as significant predictors of workflow efficiency. The strong influence of training reinforces its role in enabling nurses to use EHRs competently and confidently. Ease of use directly affects task performance, documentation accuracy, and time efficiency.^(8,31) Similarly, effective technical support minimizes system downtime and prevents workflow disruptions, a critical requirement in high-acuity clinical settings.⁽²⁶⁾ The positive association between age and workflow efficiency may reflect greater clinical experience, enabling older nurses to better integrate EHRs into complex care processes or to more fully appreciate efficiency gains compared with manual documentation.⁽¹⁾

Work satisfaction findings revealed a moderately positive overall satisfaction level among nurses using EHRs ($M = 3,57 \pm 0,73$), consistent with reports from Malaysia, Indonesia, and Ethiopia.^(1,2) Intrinsic satisfaction emerged as the most positively rated domain, indicating that EHRs contribute to feelings of job meaningfulness, enthusiasm, and professional accomplishment. These findings support prior evidence that reducing redundant tasks and improving information accessibility enhances professional engagement and motivation.^(4,14)

Relational aspects of satisfaction were also rated favorably. Nurses generally reported adequate collegial support, opportunities for learning, and a sense of belonging when using EHRs. Importantly, more than half of participants disagreed with feeling isolated from colleagues, suggesting that EHRs may enhance, rather than hinder, interprofessional communication. This is particularly relevant in resource-constrained environments like Palestine, where teamwork and shared responsibility are essential to maintaining care quality under staffing shortages and high workloads.^(24,32)

Extrinsic satisfaction scores were comparatively lower, reflecting ongoing concerns related to workload, time pressure, and system-related constraints. This finding should also be interpreted in light of the high levels of academic and occupational stress reported among Palestinian nurses, which have been shown to negatively affect psychological well-being and job satisfaction, potentially attenuating perceived benefits of workplace innovations such as EHR systems.^(33,34)

Regression analysis showed that EHR training and user-friendliness were the strongest predictors of work satisfaction, followed by technical support and age. These results are consistent with studies in Ethiopia and Saudi Arabia, which emphasize training and usability as key drivers of EHR satisfaction.^(1,14) Reliable technical support further enables smoother digital transitions and reduces frustration, thereby enhancing satisfaction.^(15,35,36) The positive association with age may reflect older nurses' appreciation of efficiency gains compared with traditional paper-based systems or a greater tolerance for system limitations in challenging work environments.

Overall, while satisfaction levels were moderate, they reflect a positive trend in the presence of essential enabling factors. However, the proportion of dissatisfied nurses underscores the need for systemic improvements.⁽³⁷⁾ In the Palestinian context, nurses operate under broader occupational and environmental stressors, including conflict-related pressures that have been shown to adversely affect quality of life and work experience.⁽²²⁾

Beyond documentation systems, Palestinian healthcare faces additional public health challenges, which further strain nursing resources and patient safety.⁽³⁸⁾

Optimizing EHR systems through sustained investment in training, infrastructure, technical support, and user-centered design is therefore essential to maximizing their benefits. Addressing these factors can enhance workflow efficiency, improve nurse satisfaction, and ultimately contribute to better patient safety and quality of care.

Limitation of the Study

The cross-sectional design is not capable of making claims about causation between EHR use and downstream events workflow efficiency and satisfaction. All findings are associational only.

The use of nonprobability convenience sampling limits the generalizability of our findings to all nurses in Palestinian governmental hospitals. Although we recruited from multiple hospitals and shifts, selection bias may have been introduced, and caution is needed when extrapolating results to other settings or populations. Nonresponder bias could not be assessed, as no data were collected on the 20 nonresponders.

The exclusion of nurses working in wards with mixed documentation (paperbased and electronic) was intentional to avoid confounding, as prior research has shown that hybrid systems produce different workflow patterns compared to fully electronic or fully paper environments.

However, this decision reduces the generalizability of our findings to the substantial proportion of Palestinian hospital wards that still operate hybrid documentation systems. Caution is therefore warranted when applying these results to mixeddocumentation settings.

Data were obtained by selfreported questionnaires, which are subject to recall bias and social desirability bias. To mitigate this, the survey was anonymous (no names or employee IDs collected), and participants were assured that individual responses would not be shared with employers. Nevertheless, some bias may remain.

Singlemethod (quantitative only) design: We lack qualitative insights into *why* usability, training, or technical support matter to nurses. Mixed methods would better explain the mechanisms behind our associations.

No objective measure of workflow efficiency (e.g., timemotion studies, EHR log data). Our selfreported efficiency scores may not perfectly reflect actual time savings or task completion accuracy.

The study was limited to Palestine governmental hospitals and may not be generalizable to other private healthcare or even other sectors.

Several key potential confounders (e.g., organizational culture; leadership support for digital and individual technology attitudes) were inadequately explored.

The technical problems and operational variables were rated based on subjective impressions instead of on system performance attributes.

Recommendation

Policy reformers and hospital administrators should aim to develop competency and confidence in nurses via regular, holistic EHR training initiatives that address nurse's needs.

An IT infrastructure & technical support teams breaks for minimizing system downtime and high user satisfaction.

System developers for EHR shall invest in User-friendliness and Customizability to tailor as per nurses' workflows and preferences.

In-depth user experiences should be elicited through longitudinal and mixed-methods design for future research to study causal relationships.

To address the positive attitude toward EHR for potential adoption, organizational intervention can include team dynamics and professional motivation besides functional technologies.

Shift patterns and workload management should be taken into consideration to make the best out of nurse welfare as well as technology usage.

Implications

Research outcomes point to the importance of training, system usability and technical support in a successful EHR implementation, thereby informing resources assignment/policy measures in the Palestinian healthcare context.

EHRs can potentially reduce bottlenecks for smooth patient care workflow and support higher performance safety quality or documentation efficiency.

EHR satisfaction of nurses may decrease turnover rate, improve job performance and foster an innovation culture and improvements within the practice.

Investigating infrastructural and organizational barriers reported to be in this study could help accelerate the digital transformation journey that has larger purpose of health system strengthening.

Lessons from Tele ICU implementation, such as the importance of user centred design and remote technical support, can inform EHR optimisation in resource limited settings.⁽³⁹⁾

The takeaways can help inform EHR strategy adaptations in lower resource settings to maximize benefits and minimize challenges for other similar low resource settings.

CONCLUSIONS

In short, this study demonstrates that adoption Electronic Medical Record (EHR) systems at the governmental hospitals in Palestine has contributive effect on nurses' work efficiency and moderating enhancing of work satisfaction. Critical drivers emerging from the study included a holistic EHR training, ease of use of the system and quality available Technical Support for these changes.

Nonetheless, concerns over technical delays, computer availability and modest satisfaction with team dynamics suggest that targeted interventions are needed. Taking steps to mitigate these barriers strengthening infrastructure, training and organizational buy-in will be required to maximize EHR benefits in this low-resource setting. The outcomes offer important clues for the policymakers, hospital administrators and health care providers that attempt to improve digital health technologies to enhance nursing practice and quality of patient care in Palestine.

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CONFLICT OF INTEREST

None.

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