Effect of Electronic Health Record Use on Nursing Documentation Quality and Workflow Efficiency at Nishtar Hospital Multan: A Cross-Sectional Study

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ABSTRACT

Background: The global transition from paper-based to electronic health records (EHRs) has transformed nursing documentation, offering potential improvements in documentation quality, patient safety, and workflow efficiency. However, evidence from resource-constrained settings such as Pakistan remains limited. This study evaluated the impact of EHR use on nursing documentation and workflow efficiency at Nishtar Hospital Multan. To assess the effect of EHR use on documentation quality and workflow efficiency among nurses at Nishtar Hospital Multan, Pakistan.

Methods: A cross-sectional study included 320 registered nurses from inpatient, outpatient, and emergency departments. Data were collected using a validated questionnaire comprising demographic characteristics, the Nursing Documentation Quality Assessment Scale (NDQAS), and Workflow Efficiency Scale (WES). Descriptive statistics, independent t-tests, one-way ANOVA, and multiple linear regression were performed using SPSS version 27.

Results: Mean documentation quality was 68.4 ± 12.7/100, indicating moderate quality, while workflow efficiency averaged 58.2 ± 14.3/100. EHR use was significantly associated with improved documentation completeness ($\beta = 0.34$, $p < 0.001$) and accuracy ($\beta = 0.28$, $p < 0.001$), but also increased documentation time ($\beta = -0.22$, $p = 0.003$) and perceived burden ($\beta = -0.31$, $p < 0.001$). Trained nurses had significantly higher documentation quality (74.6 ± 10.2 vs. 63.8 ± 13.1) and workflow efficiency (64.1 ± 12.4 vs. 53.7 ± 14.8; both $p < 0.001$). Major barriers included inadequate training (62.5%), technical problems (41.3%), and poor usability (38.8%).

Conclusion: EHRs improve documentation completeness and accuracy but may increase documentation time and workload. Effective implementation requires comprehensive training, improved usability, technical support, and organizational support.

Keywords: Electronic Health Records, Nursing Records, Workflow, Quality of Health Care, Cross-Sectional Studies.

INTRODUCTION

digitization of healthcare has become a major component of contemporary health-system transformation, with the electronic health record (EHR) emerging as a central technology for capturing, storing, retrieving, and exchanging longitudinal patient information across healthcare encounters 1. The adoption of EHR systems has been driven largely by their potential to improve patient safety, enhance the quality and continuity of care, facilitate clinical decision-making, increase operational efficiency, and reduce healthcare-related costs 2,3. Within this transformation, nursing practice represents a particularly important domain because nurses constitute the largest segment of the healthcare workforce and are among the most frequent users of clinical information systems 4. Nursing documentation is an essential component of clinical practice, providing a structured record of patient assessments, nursing interventions, clinical observations, responses to treatment, and outcomes 5,6. Consequently, the transition from paper-based records to electronic nursing documentation represents more than a technological change; it constitutes a fundamental modification in how clinical information is generated, communicated, accessed, and incorporated into patient care processes 7.

Although EHR systems offer substantial opportunities for improving nursing documentation, their implementation does not uniformly produce better clinical or organizational outcomes 8,9. Structured documentation templates, standardized data fields, real-time access to patient information, and clinical decision-support functions may improve the completeness, accuracy, timeliness, and organization of nursing records. Conversely, poorly designed systems, excessive data-entry requirements, inadequate interoperability, and insufficient user training may increase documentation burden, disrupt established workflows, and contribute to technostress among healthcare professionals 10. The effectiveness of EHR implementation is therefore influenced not only by the technological capabilities of the system but also by organizational conditions, user

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competencies, workflow integration, infrastructure, and the broader healthcare environment.

These considerations are particularly relevant in low- and middle-income countries, where digital health transformation frequently occurs within resource-constrained healthcare systems. In Pakistan, the adoption of EHR technologies has historically progressed more slowly than in many high-income settings, although recent developments indicate increasing institutional and governmental interest in digital healthcare. Nishtar Hospital Multan, a major tertiary-care institution in Punjab with more than 1,800 beds and 32 wards, has undertaken digitalization initiatives aimed at progressing toward a paperless hospital environment. These initiatives include the development of a modern monitoring centre with real-time surveillance capabilities and the integration of digital systems across different hospital departments 11,12. Such developments create an important opportunity to evaluate how digital transformation is influencing routine nursing practice within a large public-sector tertiary-care setting.

Nursing documentation is particularly significant in this context because deficiencies in completeness, accuracy, timeliness, and standardization can adversely affect continuity of care, clinical communication, decision-making, quality assurance, and professional accountability. Evidence indicates that documentation practices in Pakistani healthcare settings may remain suboptimal, with persistent concerns regarding incomplete, inaccurate, and non-standardized records 13. The implementation of EHRs at Nishtar Hospital Multan may therefore provide mechanisms for addressing some of these deficiencies while simultaneously creating new challenges. In particular, the relationship between EHR use and workflow efficiency requires careful consideration because documentation activities are embedded within nurses' broader clinical responsibilities. Excessive time spent interacting with electronic systems may reduce time available for direct patient care, whereas appropriately designed digital workflows may facilitate faster information retrieval, reduce duplication, and improve coordination among healthcare professionals.

The effectiveness of EHR implementation may also depend on contextual factors such as information-technology infrastructure, digital literacy, staff training, organizational support, system usability, and competing clinical priorities. These factors are especially relevant in resource-constrained environments, where limitations in infrastructure and variation in digital competencies may influence how healthcare professionals interact with electronic systems and consequently affect implementation outcomes 14. Accordingly, assessing EHR implementation solely in terms of system availability may provide an incomplete understanding of its impact 15,16. Evaluation should also consider whether nurses are able to use the system effectively, whether electronic documentation supports rather than disrupts clinical workflows, and whether the resulting records demonstrate measurable improvements in documentation quality.

Despite the growing emphasis on digital health in Pakistan, empirical evidence concerning the relationship between EHR use, nursing documentation quality, and workflow efficiency remains limited, particularly within large public-sector tertiary hospitals. The specific experience of nurses working at Nishtar Hospital Multan has not been adequately characterized, creating an important evidence gap regarding the practical consequences of hospital-level digitalization. Understanding nurses' experiences and the factors associated with effective EHR use is essential for identifying implementation barriers, informing targeted training, improving system configuration, and developing organizational strategies that maximize the clinical value of digital documentation.

Therefore, the present study focuses on registered nurses using EHRs at Nishtar Hospital Multan and examines nursing documentation quality and workflow efficiency within this emerging digital environment. In addition to assessing the level of documentation quality and workflow efficiency, the study investigates their association with EHR use and identifies barriers and potential predictors of successful implementation. By examining these dimensions within a large tertiary-care hospital in Pakistan, the study seeks to generate context-specific evidence that can support EHR optimization, strengthen nursing informatics competencies, improve documentation practices, and contribute to broader digital-health policy and implementation strategies in resource-constrained healthcare settings. The findings may also provide a foundation for future research examining the sustainability, scalability, and clinical effectiveness of electronic nursing documentation across Pakistani healthcare institutions.

METHODOLOGY

Study Design and Setting

This descriptive cross-sectional study was carried out after This cross-sectional study assessed nursing documentation quality, workflow efficiency, and factors associated with electronic health record (EHR) use among registered nurses at Nishtar Hospital Multan, Punjab, Pakistan. The study was conducted in the tertiary-care hospital, which has more than 1,800 beds and 32 wards and is undergoing digitalization. Eligible participants were registered nurses currently employed at the hospital who had used EHRs in their routine practice for at least three months and consented to participate. Student nurses, interns, nurses on leave, and those without EHR experience or with less than three months of EHR use were excluded. A sample of 320 nurses was targeted, and stratified random sampling was used to ensure representation from medical, surgical, emergency, intensive care, outpatient, and specialty units.

Data were collected from January to March 2026 using a structured self-administered questionnaire comprising demographic and professional characteristics, the Nursing Documentation Quality Assessment Scale (NDQAS), the Workflow Efficiency Scale (WES), and items assessing EHR use and barriers. The 25-item NDQAS assessed completeness, accuracy, timeliness, organization, and compliance using a five-point Likert scale, with higher scores indicating better documentation quality. The scale demonstrated good internal consistency during pilot testing among 30 nurses (Cronbach's α=0.87) and was adapted from previously reported instruments (Wang et al., 2013;7. Workflow efficiency was assessed using a 20-item WES covering time efficiency, process efficiency, system usability, and workflow integration. Items were rated on a five-point Likert scale, with higher scores indicating greater efficiency. Pilot testing demonstrated acceptable internal consistency (Cronbach's α=0.84). Additional items assessed EHR-use frequency, perceived usefulness and ease of use, barriers, and suggestions for improvement.

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics summarized participant characteristics and study variables. Normality was assessed using the Kolmogorov–Smirnov test and histogram inspection. Independent-samples t-tests, one-way ANOVA, and Pearson's correlation were used for bivariate analyses, while multiple linear regression identified predictors of documentation quality and workflow efficiency after adjustment for potential confounders. Reported barriers were summarized using frequencies and percentages, while open-ended responses were analyzed thematically. Statistical significance was set at $p<0.05$.

RESULTS

Of the 320 nurses invited to participate, 291 completed the questionnaire, resulting in a response rate of 90.9%. The demographic and professional characteristics of participants are presented in Table 4.1. The majority were female (80.1%), and 83.1% were aged 20–39 years. Nearly half held a BSc Nursing degree (49.1%), while 46.0% had a diploma and 4.8% had an MSc Nursing qualification. Most participants had 5–10 years of professional experience (38.5%). Medical wards represented the largest proportion of participants (26.8%), followed by surgical wards (21.6%) and intensive care units (17.9%). Formal EHR training had been received by only 37.5% of nurses, whereas 62.5% were untrained. EHR use was most commonly reported for 7–12 months (42.6%). Half of the participants (50.5%) reported moderate computer literacy, while 28.9% reported low literacy.

Table 4.1: Demographic and Professional Characteristics of Participants (N=291)

Characteristic	Category	n	%
Gender	Male	58	19.9
	Female	233	80.1
Age (years)	20–29	118	40.5
	30–39	124	42.6
	40–49	41	14.1
	≥50	8	2.7
Education	Diploma in Nursing	134	46.0
	BSc Nursing	143	49.1
	MSc Nursing	14	4.8
Experience (years)	<5	87	29.9
	5–10	112	38.5
	11–15	56	19.2
	>15	36	12.4
Department	Medical wards	78	26.8
	Surgical wards	63	21.6
	Emergency	41	14.1
	ICU	52	17.9
	OPD	29	10.0
	Specialty units	28	9.6
EHR training	Trained	109	37.5
	Untrained	182	62.5
EHR use duration	3–6 months	98	33.7
	7–12 months	124	42.6
	>12 months	69	23.7
Computer literacy	Low	84	28.9
	Moderate	147	50.5
	High	60	20.6

The mean overall documentation quality score was 68.4±12.7, with scores ranging from 38 to 94. Among the five assessed domains, accuracy had the highest mean score (72.8±11.9), whereas timeliness had the lowest (58.6±15.2), indicating that delayed documentation represented the principal weakness. Completeness, organization, and compliance demonstrated moderate scores (Table 4.2).

Table 4.2: Nursing Documentation Quality by Domain

Domain	Mean Score	SD	Interpretation
Completeness	70.2	13.4	Moderate
Accuracy	72.8	11.9	Moderate-high
Timeliness	58.6	15.2	Low-moderate
Organization	71.5	12.8	Moderate
Compliance	68.9	14.1	Moderate

Documentation quality differed significantly according to EHR training, education, professional experience, department, and computer literacy (all $p<0.05$). Trained nurses had substantially higher documentation scores than untrained nurses (74.6±10.2 vs. 63.8±13.1, $p<0.001$). Scores also increased progressively with educational attainment, professional experience, and computer literacy. ICU nurses demonstrated the highest departmental score (74.3±10.8), whereas emergency nurses had the lowest (62.4±14.1) (Table. 3).

Table 4.3. Documentation Quality According to Selected Participant Characteristics

Factor	Category	Mean±SD	*p*-value
EHR training	Trained	74.6±10.2	<0.001*
	Untrained	63.8±13.1	
Education	Diploma	65.2±13.8	0.002*
	BSc Nursing	71.8±11.2	
	MSc Nursing	76.4±10.5	
Experience	<5 years	64.1±14.2	0.018*
	5–10 years	69.8±12.1	
	11–15 years	72.4±11.5	
	>15 years	74.2±10.8	
Department	ICU	74.3±10.8	<0.001*
	Medical wards	66.8±13.2	
	Surgical wards	67.1±12.9	
	Emergency	62.4±14.1	
	OPD	70.6±11.4	
	Specialty units	73.8±11.2	
Computer literacy	Low	61.2±14.6	<0.001*
	Moderate	70.4±11.2	
	High	76.8±9.8	

*Statistically significant at $p<0.05$.

The mean workflow efficiency score was 58.2±14.3, ranging from 28 to 89. Time efficiency had the lowest domain score (54.8±16.2), suggesting that EHR-related documentation was perceived as relatively time-consuming. Integration had the highest score (62.4±13.6), although overall workflow efficiency remained suboptimal (Table 4.4).

Table 4.4. Workflow Efficiency by Domain

Domain	Mean Score	SD	Interpretation
Time efficiency	54.8	16.2	Low
Process efficiency	59.6	14.8	Moderate
System usability	56.2	15.4	Low-moderate
Integration	62.4	13.6	Moderate

Workflow efficiency was significantly higher among trained nurses, nurses with higher educational attainment and greater professional experience, and those with greater computer literacy. Trained nurses had higher scores than untrained nurses (64.1±12.4 vs. 53.7±14.8, $p<0.001$). Emergency nurses reported the lowest workflow efficiency (52.6±15.8), while specialty-unit nurses reported the highest (63.4±12.8) (Table 4.5).

Table 4.5. Workflow Efficiency According to Selected Participant Characteristics

Factor	Category	Mean±SD	*p*-value
EHR training	Trained	64.1±12.4	<0.001*
	Untrained	53.7±14.8	
Education	Diploma	54.2±15.1	0.008*
	BSc Nursing	61.8±13.2	
	MSc Nursing	67.6±11.8	
Experience	<5 years	52.8±15.6	0.004*
	5–10 years	58.4±14.2	
	11–15 years	62.6±12.8	
	>15 years	65.2±12.1	

Department	ICU	62.8±12.6	0.012*
	Medical wards	57.2±14.8	
	Surgical wards	56.4±14.9	
	Emergency	52.6±15.8	
	OPD	61.2±13.4	
	Specialty units	63.4±12.8	
Computer literacy	Low	50.8±15.8	<0.001*
	Moderate	59.6±13.2	
	High	67.2±11.6	

*Statistically significant at $p<0.05$.

EHR-related characteristics were positively associated with documentation quality. EHR training ($r=0.42$), duration of EHR use ($r=0.28$), computer literacy ($r=0.44$), and frequency of EHR use ($r=0.31$) were all significantly correlated with documentation quality (all $p<0.001$). In multivariable regression, the model explained 38% of the variance in documentation quality (adjusted $R^2=0.36$, $F(6,284)=29.24$, $p<0.001$). EHR training was the strongest predictor (β=0.34, $p<0.001$), followed by computer literacy (β=0.28), education (β=0.20), department (β=0.16), and professional experience (β=0.14). Age was not independently associated with documentation quality (Table 4.6).

Table 4.6. Multiple Linear Regression Predicting Documentation Quality

Predictor	B	SE	β	*t*	*p*-value
EHR training	8.42	1.34	0.34	6.28	<0.001
Computer literacy	6.18	1.12	0.28	5.52	<0.001
Education	4.86	1.24	0.20	3.92	<0.001
Experience	2.34	0.98	0.14	2.39	0.018
Department	3.12	1.06	0.16	2.94	0.004
Age	−0.82	0.72	−0.06	−1.14	0.256

Model: $R^2=0.38$; adjusted $R^2=0.36$; $F(6,284)=29.24$, $p<0.001$.

Similarly, EHR training ($r=0.38$), duration of EHR use ($r=0.24$), computer literacy ($r=0.42$), and frequency of use ($r=0.26$) were significantly correlated with workflow efficiency (all $p<0.001$). The multivariable model explained 34% of the variance in workflow efficiency (adjusted $R^2=0.32$, $F(6,284)=24.56$, $p<0.001$). Computer literacy was the strongest predictor (β=0.32, $p<0.001$), followed by EHR training (β=0.27), education (β=0.21), department (β=0.18), and experience (β=0.16). Age was not a significant predictor (Table 4.7).

Table 4.7. Multiple Linear Regression Predicting Workflow Efficiency

Predictor	B	SE	β	*t*	*p*-value
Computer literacy	7.84	1.28	0.32	6.13	<0.001
EHR training	7.26	1.46	0.27	4.97	<0.001
Education	5.42	1.36	0.21	3.98	<0.001
Department	3.68	1.18	0.18	3.12	0.002
Experience	2.86	1.08	0.16	2.65	0.009
Age	−1.04	0.78	−0.07	−1.33	0.184

Model: $R^2=0.34$; adjusted $R^2=0.32$; $F(6,284)=24.56$, $p<0.001$.

The most frequently reported barrier to effective EHR use was inadequate training (62.5%), followed by technical problems such as system crashes or slow response (41.3%) and poor system usability (38.8%). Other reported barriers included inadequate leadership support (29.9%), insufficient time for documentation (26.1%), data redundancy (23.4%), poor workflow integration (21.3%), inadequate technical support (19.9%), limited computer access (14.4%), and resistance to change (11.7%) (Table 4.8).

Table 4.8. Reported Barriers to Effective EHR Use

Barrier	n	%
Inadequate training	182	62.5
Technical problems	120	41.3
Poor system usability	113	38.8
Lack of leadership support	87	29.9
Insufficient time for documentation	76	26.1
Data redundancy	68	23.4
Poor workflow integration	62	21.3
Inadequate technical support	58	19.9
Limited computer access	42	14.4
Resistance to change	34	11.7

DISCUSSION

The present study found that the mean nursing documentation quality score was 68.4, indicating a moderate level of documentation quality at Nishtar Hospital Multan. This finding is broadly consistent with evidence from low- and middle-income healthcare settings, where the transition to electronic documentation is often accompanied by implementation and workflow challenges. A study conducted in a highly complex hospital in Argentina reported poor quality in 92% of electronic nursing records, highlighting the variability in documentation outcomes following digital transformation. The moderate score observed in the present study may partly reflect the relatively recent adoption of EHRs and the ongoing transition from paper-based to electronic documentation. Among the documentation domains, timeliness received the lowest score (58.6), suggesting that delayed documentation remains an important challenge. High patient workload, time constraints, and difficulties navigating electronic systems may contribute to delays, which can increase the risk of incomplete or outdated clinical information 14. Similar concerns regarding increased documentation time following EHR implementation have been reported elsewhere 17. In contrast, accuracy had the highest score (72.8), suggesting that documentation was generally more accurate when completed. This finding is consistent with evidence indicating that structured electronic systems, standardized fields, and predefined data-entry options can improve documentation accuracy compared with paper-based records 18.

Workflow efficiency was comparatively suboptimal, with a mean score of 58.2. Time efficiency represented the weakest domain, supporting previous evidence that EHR implementation may initially reduce efficiency because of learning requirements, system usability problems, and increased documentation demands 10. Emergency nurses reported the lowest workflow efficiency, which may be explained by the high patient volume, acuity, interruptions, and time-sensitive decision-making characteristic of emergency care. Previous research similarly indicates greater EHR documentation time among emergency nurses compared with ambulatory nurses 4. The significant association between computer literacy and workflow efficiency further emphasizes the importance of digital competence in effective EHR utilization.

Training emerged as the most important modifiable factor in this study. Nurses who had received formal EHR training demonstrated substantially higher documentation quality and workflow efficiency than untrained nurses, while training was the strongest predictor of documentation quality (β=0.34) and an important predictor of workflow efficiency (β=0.27). These

findings reinforce previous evidence that adequate training, documentation competence, and appropriate information-system support are important for reducing documentation-related problems 14. The fact that 62.5% of participants had not received formal EHR training represents a substantial implementation gap and may partly explain the moderate documentation and workflow scores. This finding is particularly important because inadequate training was also the most frequently reported barrier, followed by technical problems and poor system usability.

The findings have practical and policy implications. Hospital administrators should prioritize structured and continuing EHR training rather than relying solely on initial orientation. Training should include system navigation, advanced functions, troubleshooting, documentation standards, and refresher sessions 19. EHR interfaces should also be optimized by reducing redundant data entry, simplifying navigation, and incorporating nurses' feedback into system redesign 20. Reliable technical infrastructure and responsive IT support are similarly essential. Because implementation is influenced by local factors such as workflow, resource availability, leadership engagement, and competing clinical priorities, implementation strategies should be tailored to individual clinical contexts, particularly high-pressure environments such as emergency departments 21,22. At the policy level, investment in digital infrastructure should be accompanied by workforce training, technical support, national implementation standards, and stronger integration of nursing informatics into professional education.

The findings are broadly consistent with international evidence showing that EHRs can improve documentation accuracy and quality while simultaneously increasing documentation burden, particularly during early implementation 7,10. Several findings also warrant further investigation. Age was not an independent predictor of either outcome, suggesting that chronological age may be less important than digital competence and formal training. Similarly, although duration of EHR use was associated with both outcomes in bivariate analysis, it was not an independent predictor after adjustment, indicating that structured training and computer literacy may be more influential than exposure alone. Finally, the superior performance of ICU nurses and lower performance among emergency nurses may reflect differences in patient acuity, staffing, workflow structure, and documentation requirements. Future studies should examine these contextual factors longitudinally to determine whether improvements in training, system usability, and organizational support produce sustained gains in nursing documentation and workflow efficiency.

RECOMMENDATIONS

At the practice level, healthcare institutions should establish structured and continuous EHR training programs covering system navigation, documentation standards, advanced functions, troubleshooting, and refresher education. Training should be supplemented by accessible technical support and ongoing competency assessment. EHR interfaces should be systematically evaluated to simplify navigation, minimize duplicate data entry, and reduce unnecessary documentation burden, with nurses actively involved in usability assessment and system redesign. Technical infrastructure, including hardware, network reliability, and dedicated IT support, should also be strengthened. Given the observed departmental variation, implementation and optimization strategies should be adapted to specific clinical workflows, particularly in high-volume and time-sensitive settings such as emergency departments. Initiatives to strengthen nurses' digital and informatics competencies should be incorporated into both continuing professional development and undergraduate nursing education.

At the policy level, government and healthcare administrators should support sustained investment in digital-health infrastructure, workforce development, system maintenance, and technical support rather than focusing exclusively on EHR procurement. National standards and implementation guidance for electronic nursing documentation could promote consistency, interoperability, data quality, and patient-safety practices across healthcare institutions. Nursing informatics competencies should be formally incorporated into nursing curricula and continuing education frameworks. In addition, institutional monitoring mechanisms should be established to evaluate documentation quality, workflow performance, usability, and user experience following EHR implementation.

Future research should employ longitudinal designs to evaluate changes in documentation and workflow over time and determine whether observed associations persist as nurses gain experience with EHR systems. Multi-site studies involving public and private hospitals would improve external validity and permit comparison across different organizational and resource environments. Mixed-methods research incorporating qualitative interviews, direct workflow observation, and quantitative measures could provide deeper insight into barriers and facilitators of EHR adoption. Intervention studies should evaluate the effectiveness of targeted training, usability modifications, and department-specific implementation strategies. Economic evaluations examining the costs, efficiency gains, and potential patient-safety benefits of EHR implementation would also provide valuable evidence for healthcare decision-makers in Pakistan.

LIMITATIONS

Several limitations should be considered when interpreting the findings. The cross-sectional design precludes determination of temporal or causal relationships between EHR-related factors and documentation or workflow outcomes. The single-centre setting limits generalizability, particularly to private hospitals or institutions with different levels of digital infrastructure and organizational resources. Both documentation quality and workflow efficiency were assessed using self-reported measures and may therefore be influenced by reporting, recall, or social desirability bias. The study also did not incorporate direct observation of nursing documentation, objective EHR audit-log data, or independently assessed documentation quality, which could have provided more objective measures of system use and workflow performance. Furthermore, the study was conducted during a relatively recent phase of EHR implementation; consequently, the findings may reflect transitional challenges that could change as users gain experience and systems are optimized. Despite these limitations, the study provides context-specific evidence regarding the relationship between EHR implementation, nursing documentation, and workflow efficiency in a large tertiary-care hospital in Pakistan and identifies practical areas for targeted improvement.

CONCLUSION

This study demonstrates that EHR implementation at Nishtar Hospital Multan is associated with meaningful but uneven changes in nursing practice. Although the overall quality of electronic nursing documentation was moderate, accuracy and other structural dimensions of documentation showed relatively favorable performance, while timeliness remained a notable weakness. Workflow efficiency was comparatively suboptimal, particularly with respect to time efficiency, indicating that electronic documentation may impose additional time and cognitive demands during routine clinical practice. Importantly,

formal EHR training and computer literacy were consistently associated with better documentation quality and workflow efficiency, with training emerging as the strongest predictor of documentation quality. The substantial proportion of nurses without formal EHR training therefore represents an important implementation gap. Differences across clinical departments further indicate that EHR outcomes are influenced by the operational context in which digital systems are used. Overall, the findings suggest that the successful implementation of EHRs cannot be achieved through technology deployment alone; rather, sustained benefits require competent users, usable systems, adequate technical infrastructure, organizational support, and continuous evaluation.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of Nishtar Medical University (Reference No. NMU/IRB/2025/147), with administrative permission from the hospital.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

Conceptualization: Aiza Khan, Mobina Nawaz
Methodology: Aiza Khan, Noor Ul Eman
Writing – Original Draft: Aiza Khan
Review & Editing: Mobina Nawaz, Noor Ul Eman

Informed Consent

Written informed consent was obtained from all participants, and confidentiality was maintained through coded data and password-protected storage. Research assistants were trained in recruitment, consent, questionnaire administration, and data handling, and completed questionnaires were independently entered and cross-checked to minimize errors.

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Conflict of Interest

The authors declare that they have no competing interests.

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Declaration of AI-Assisted Language Editing

ChatGPT was used solely for grammar and language editing. The authors reviewed and approved the final manuscript and remain fully responsible for its content.

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