EVALUATING THE USABILITY AND EFFECTIVENESS OF ELECTRONIC HEALTH RECORDS IN PUBLIC HOSPITALS: A MIXED METHODS STUDY

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Abstract

Electronic health records (EHRs) are being adopted globally, but robust evaluations in public hospital contexts are lacking. This concurrent embedded mixed methods study evaluated nurses' perspectives on EHR usability and impacts 6 months after implementation across 10 public hospitals. Surveys using the System Usability Scale and satisfaction questionnaires were completed by 150 nurses. Additionally, 15 nurses participated in semi-structured interviews eliciting experiences. EHR usage data provided utilization metrics. Survey results showed mean usability score of 82/100 indicating high usability but revealed areas needing workflow refinement. Interviews emphasized insufficient training, hardware gaps causing delays, and impatience with initial productivity declines before efficiency benefits. However, metrics showed rapid uptake within 6 months. An integrated analysis approach provided comprehensive insights into barriers and facilitators. Tailored training for functionality and workflows, leadership support during transitional productivity dips, and continuous quality improvement are advised for effective EHR adoption. The study provides a model for user-centered, context-sensitive evaluation to guide system optimizations and change management for maximal EHR effectiveness in enhancing care coordination and outcomes.

Introduction

The adoption of electronic health records (EHRs) has been rapidly accelerating around the world, driven by evidence of their ability to enhance care coordination, patient safety, documentation, data access, communication, and service efficiency when thoughtfully implemented (Ayatollahi et al., 2015; Kruse & Kristof, 2020). However, healthcare continues to lag behind other

industries in information technology integration and optimization. Public hospitals face particular challenges around resource constraints and the need for context-sensitive evaluations (Kruse et al., 2018). User assessments focused on EHR usability and workflow integration are crucial for adoption success since dissatisfaction and suboptimal application of EHRs impede their effectiveness and return on investment (Ayatollahi et al., 2015).

Nurses are integral users of EHR systems. Their experiences offer vital insights into barriers and facilitators for enhancing usability and clinical effectiveness at point of care. This study aimed to evaluate nurses' perspectives on EHR usability, impacts on productivity and workflows, and adoption barriers and facilitators 6 months after implementation across 10 public hospitals. A mixed methods approach provided complementary quantitative usability assessments and qualitative experiences illuminating contextual factors. The study provides a robust evaluation model to guide similar hospitals in maximizing EHR success.

Background

Electronic Health Records in Public Hospitals

EHRs involve digital documentation systems encompassing patients' medical and treatment histories to facilitate efficient, integrated care (Palabindala et al., 2020). When broadly adopted, EHRs enable rapid data sharing across providers to inform diagnoses and care decisions through access to comprehensive health profiles. However, public hospitals frequently face barriers around costs, leadership support, infrastructure and IT capabilities that slow EHR adoption, warranting tailored implementation and evaluation approaches (Kruse et al., 2018).

EHRs Role in Care Coordination and Quality

EHRs key strengths are enhancing care coordination, continuity, and safety through accurate, shareable documentation that reduces communication breakdowns (Ayatollahi et al., 2015). EHRs can integrate clinical decision support and alerts to avoid errors while data aggregation powers quality measurement and improvement. However, productivity and usability challenges can negate benefits (Palabindala et al., 2020). User-centered assessments are vital.

Nurses' Experiences as Integral EHR Users

Nurses are central EHR users for documentation, care planning, and coordinating patient needs (Strudwick, 2015). Their clinical workflows and efficiency are impacted by EHR design factors. Nurses' experiences reveal strengths and areas for system refinements to enable effective use (Ayatollahi et al., 2015). Tailoring EHRs to enhance point of care applications is key.

Conceptual Model

This study was guided by the Unified Theory of Acceptance and Use of Technology model examining how performance expectancy, effort expectancy, social influence and facilitating

conditions affect adoption (Venkatesh et al., 2003). Quantitative and qualitative data provided comprehensive insights into these domains from nurses' perspectives.

Methods

Study Design

A concurrent embedded mixed methods design was utilized with complementary quantitative surveys and qualitative interview data around nurses' EHR perspectives collected simultaneously 6 months post-implementation (Creswell & Plano Clark, 2017).

Setting and Sample

The study setting encompassed a sample of 10 public hospitals under the Ministry of Health in Saudi Arabia in which a new commercial EHR system was implemented between January-June 2021 across inpatient units. The study surveyed 150 nurses and interviewed 15 nurses across participating hospitals 6 months after adoption in December 2021. Purposive sampling ensured sample diversity.

Data Collection

Quantitative data consisted of EHR usability ratings using the validated 10-item System Usability Scale (SUS) and satisfaction questionnaires (Brooke, 1996). Qualitative data involved semi-structured individual interviews around 40 minutes in length to explore nurses' experiences with the EHR based on an open-ended guide. Interviews were recorded and transcribed. Deidentified EHR usage data was obtained from system logs.

Analysis

SUS scores were calculated using standard methodology (Brooke, 1996). Interview transcripts underwent inductive thematic analysis using Braun and Clarke's approach with NVivo 12 software (Braun & Clarke, 2006). Quantitative and qualitative results were analyzed, triangulated, and integrated narratively using a weaving approach to develop meta-inferences around the EHR implementation (Fetters et al., 2013).

Ethical Considerations

Approvals were obtained from institutional review boards at participating sites. Voluntary informed consent was secured. Confidentiality was maintained.

Results

Sample Characteristics

150 nurses completed the surveys, of which 73% were female which is representative of the nursing workforce in Saudi Arabia. The mean age was 32.2 years and nurses had an average of

7.1 years of experience. 15 nurses participated in qualitative interviews including both genders and a range of ages and tenures.

System Usability and User Satisfaction

The mean SUS score for the EHR system was 82 out of 100, indicating high usability overall based on nurses' ratings. However, examining item responses revealed lower scores for system complexity, need for support to use effectively, and integration with workflows, pinpointing areas for refinement. The satisfaction questionnaire highlighted desires for enhanced customization, data access, and training.

Qualitative Themes

Five key themes emerged from the inductive coding:

1.   Suboptimal initial training for workflows rather than just system commands

2.   Gaps in hardware and optimal device access impacting use

3.   Decreased productivity initially before time efficiencies realized after the learning curve

4.   System improvements in documentation quality and data access

5.   Ongoing user input and optimization needed for sustained adoption

The qualitative findings provided contextual details on barriers in the initial transition phase that impacted nurses' satisfaction despite overall high usability. The triangulation showed training, workflow integration, and hardware enhancement represent opportunities moving forward.

Usage Pattern Metrics

EHR usage data revealed rapid uptake within 6 months of launch. Documentation compliance reached over 80% across units by month 3 and continued to rise. This aligns with interview reflections on increasing integration into workflows after the initial adjustment period.

Discussion

This concurrent embedded mixed methods study provided robust insights into nurses' perspectives on the usability and impacts on care of a new EHR system 6 months after adoption across multiple public hospitals. The integration of complementary quantitative surveys and qualitative interview data through a concurrent triangulation process allowed comprehensive assessment of technology adoption factors highlighted in existing models (Venkatesh et al., 2003).

Key findings pointing to training gaps specific to workflows rather than solely system commands, suboptimal access to devices impacting timely documentation, and transitional productivity declines mirror similar studies (Ayatollahi et al., 2015; Strudwick, 2015). However,

rapid uptake within 6 months reinforces that benefits can exceed initial challenges with a thoughtfully planned implementation approach (Palabindala et al., 2020).

Recommendations include providing ongoing personalized training tailored to nursing workflows versus one-time general system orientations, fixing hardware barriers, and fostering leadership support during transitional productivity declines before efficiency gains. Continuous quality improvement via user input is vital.

This study provides considerations and an evaluation blueprint for optimal EHR adoption in similar public hospital contexts to maximize usability and clinical effectiveness based on a comprehensive socio-technical assessment of facilitators and challenges. Understanding nurses' experiences provides vital groundwork to guide needed system refinements and change management strategies.

Limitations include the focus on a single commercial EHR and self-reported data. However, the in-depth mixed methods approach provided meaningful insights and model for context-specific evaluation needed for successful EHR optimization. As technology expands in healthcare, thorough assessment of usability and workflows empowers user-centered improvements for patient care enhancement.

Conclusion

This mixed methods study assessing nurses' perspectives highlighted EHR benefits for documentation and coordination but revealed opportunities to refine training and hardware for public hospital settings. Despite initial productivity declines, usage metrics showed increasing integration. A user-centered, contextualized assessment approach guided by nurses' experiences provides considerations to tailor EHR adoption to enable clinical effectiveness. Upfront and ongoing evaluations are key for technology optimization. Findings provide a model for nuanced EHR assessment that can be replicated to thoughtfully guide adoption and enhance quality aims.

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