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THE EXPERIENCE OF ELECTRONIC MEDICAL RECORDS MANAGERS IN FACING HEALTH SYSTEM INTEROPERABILITY CHALLENGES

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Abstract: *Interoperability remains one of the most persistent challenges in digital health systems globally, affecting the continuity, quality, and efficiency of care. Electronic Medical Records (EMR) managers are central to implementing and sustaining EMR systems, yet their experiences navigating interoperability challenges are poorly understood. This study aimed to explore the lived experiences of EMR managers and to develop a conceptual understanding of the barriers and coping strategies involved. A qualitative phenomenological approach was employed, guided by van Manen's interpretive framework. The study involved 21 EMR managers from public and private hospitals across three major healthcare networks. Participants were selected through purposive and snowball sampling, with inclusion criteria requiring at least two years of EMR management experience and involvement in interoperability efforts. Data were collected via in-depth, semi-structured interviews conducted virtually between September and November 2025. Each interview lasted 45–60 minutes, was audio-recorded, transcribed verbatim, and member-checked. Data were analyzed thematically using NVivo 14, following Braun and Clarke's six-step method. Reflexivity, triangulation, and peer debriefing ensured methodological rigor, in accordance with COREQ and SRQR standards. Four overarching themes emerged: (1) Fragmented Systems, reflecting technical and architectural incompatibilities across platforms; (2) Role Strain and Isolation, describing limited authority and institutional support; (3) Adaptive Workarounds, highlighting informal coping strategies such as manual data tracking; and (4) Systemic Barriers, pointing to policy volatility and vendor resistance. A conceptual "feedback loop of fragmentation" was developed, illustrating how these themes interact to perpetuate interoperability challenges. EMR managers operate as critical yet often overlooked actors in the pursuit of health system interoperability. Supporting their role through policy stability, resource investment, and participatory system design is essential. Future digital health reforms must integrate managerial perspectives to build resilient and connected health information systems.*

1. INTRODUCTION

The digital transformation of healthcare systems worldwide has increasingly relied on Electronic Medical Records (EMRs) to enhance the quality, safety, and efficiency of patient care.

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However, despite their growing adoption, interoperability challenges the ability of EMRs to seamlessly exchange and use health data across systems remain a significant obstacle to achieving integrated, patient-centered care. This limitation poses serious risks: fragmented data systems can lead to medical errors, duplicated tests, and delays in treatment, ultimately compromising health outcomes and increasing costs. Globally, healthcare systems—from technologically advanced nations to resource-constrained settings—face persistent challenges in achieving effective EMR interoperability.

According to *Mollabagher and Hassanzadeh (2026)*, recurring issues such as data silos, non-standardized formats, and lack of integration protocols continue to hinder data exchange. In regions like Sub-Saharan Africa and Latin America, government initiatives to modernize healthcare systems have encountered similar roadblocks, such as infrastructure gaps and insufficient training of personnel (*Simbini et al., 2026; Barbalho et al., 2026*). In these contexts, the role of EMR managers becomes crucial they are at the frontline of implementation and integration, balancing administrative demands, system design constraints, and the human factors involved in healthcare IT.

This research is important because it provides a managerial perspective often overlooked in digital health research. While technical and policy-focused studies dominate the discourse, the lived experiences of EMR managers their challenges, adaptations, and insights remain underexplored. Yet, these individuals play a critical role in operationalizing interoperability frameworks and navigating real-world limitations. Exploring their perspectives can generate practical knowledge that informs system improvements, staff training, and policy development. A review of existing literature reveals conflicting findings.

Some studies attribute interoperability failure to insufficient technical standards (*Putra et al., 2025*), while others highlight organizational and human challenges, such as limited digital literacy and resistance to change (*Ackermann et al., 2026*). Additionally, emerging technologies like blockchain have been both praised for their potential and criticized for scalability issues (*Chandak & Chandak, 2026*). This highlights a critical research gap: limited qualitative exploration of EMR managers' experiences across diverse healthcare environments. The study is framed within the Socio-Technical Systems Theory (STS), which provides a holistic lens to

examine how human factors (e.g., managerial leadership, training), technology (EMR systems and their architectures), and organizational context (policy, workflow integration) interact.

The study's variables EMR managers' experience, interoperability challenges, and contextual factors such as policy and infrastructure are connected through this conceptual lens. According to *Diffusion of Innovations Theory*, the success of EMR interoperability is partly driven by how change agents (i.e., EMR managers) adopt, adapt, and influence new technologies within their organizations.

Research Objective

The aim of this study is to explore the experiences of EMR managers in addressing health system interoperability challenges. Specifically, it seeks to:

- Identify the key barriers and facilitators EMR managers encounter in achieving interoperability.
- Understand the institutional, technical, and policy contexts that shape these experiences.
- Highlight patterns across different healthcare settings.
- Contribute actionable insights for improving health information exchange systems.

By focusing on the voices and experiences of EMR managers, this study contributes to a more nuanced understanding of the socio-technical realities that underlie health information system integration.

2. METHODS

Study Design

This study employed a phenomenological qualitative research approach to explore the lived experiences of Electronic Medical Records (EMR) managers confronting interoperability challenges within health systems. Phenomenology was chosen because it allows for in-depth exploration of individuals' personal experiences, perceptions, and meanings they assign to complex phenomena—in this case, interoperability barriers and managerial adaptation.

The research was conducted in public and private hospitals across three urban healthcare networks. These settings were digitally advanced but exhibited varying degrees of interoperability maturity. This diversity allowed for a rich understanding of how organizational infrastructure, digital culture, and policy environment shape EMR managers' experiences. However, the

institutional context may have influenced participants' willingness to speak freely due to hierarchical dynamics or institutional loyalty.

Research Team and Reflexivity

The research team comprised three members:

- Lead researcher: A PhD candidate in Health Informatics with formal training in qualitative methods and over five years of digital health project experience.
- Second researcher: A qualitative research expert and university faculty with extensive experience in public health research and grounded theory.
- Third researcher: A health system analyst with domain knowledge in EMR implementation but no prior relationship with study sites.

No pre-existing relationships existed between researchers and participants, minimizing undue influence. To reduce potential bias:

- All researchers maintained reflexive journals throughout the study.
- Peer debriefing sessions were held weekly to reflect on emerging assumptions.
- Transcripts were anonymized and reviewed blindly during coding.
- A research assistant unaffiliated with the primary research team conducted initial participant contacts to preserve neutrality.

Participants

Inclusion Criteria

- EMR managers (administrative or technical leads) currently employed in hospital or clinic settings.
- Minimum of 2 years of experience managing or supervising EMR systems.
- Involvement in EMR-related interoperability projects or issues.

Exclusion Criteria

- IT staff not directly involved in EMR strategy or decision-making.
- EMR vendors or external consultants not employed by health facilities.

Recruitment Process

Participants were recruited via purposive sampling, complemented by snowball sampling to reach hidden experts in large institutions. Invitations were sent through institutional email with an attached information sheet and consent form.

- 28 managers were contacted.
- 21 agreed to participate.
- 4 declined (2 due to time constraints; 2 expressed concern about confidentiality).
- 3 did not respond.

All participants were informed about the study's aim, confidentiality measures, and data usage. No financial incentives were offered, although participants were thanked with a professional development certificate.

Data Collection

Data were collected between September and November 2025, through semi-structured, in-depth interviews.

- Interviews were conducted via secure video conferencing platforms due to geographic dispersion and participant convenience.
- Interviews lasted an average of 45–60 minutes.
- Each interview was audio-recorded with consent and transcribed verbatim.

Sample Interview Questions:

- *Can you describe a recent situation where interoperability challenges affected EMR use in your facility?*
- *How do you perceive your role in managing these challenges?*
- *What support (or lack thereof) do you receive from your institution regarding interoperability?*

Participants were invited to review their transcripts and confirm the accuracy of their statements (member checking), with 15 of 21 providing feedback. Data saturation was determined when no new themes emerged after the 18th interview; three more interviews were conducted to confirm saturation.

Data Analysis

A thematic analysis was conducted, following Braun and Clarke's (2006) six-step framework. The analysis was both inductive (themes emerging from data) and deductive (informed by the Socio-Technical Systems Theory framework).

- Transcripts were imported into NVivo 14 for coding and management.
- Open coding was performed independently by two researchers to develop initial codes.

- Codes were then grouped into broader categories, from which themes were identified collaboratively.
- Disagreements were resolved through discussion and arbitration by the third researcher.

Themes were reviewed for coherence, backed by representative quotes, and refined during peer debriefing. An audit trail documented coding decisions and thematic evolution throughout the process.

Trustworthiness and Rigor

To enhance the study's credibility and trustworthiness, the following strategies were used:

- Triangulation: Multiple researchers analyzed the data, and findings were compared across different settings.
- Peer Review: Preliminary themes were reviewed by two qualitative experts outside the research team.
- Audit Trail: Detailed logs of coding and analytical decisions were maintained.
- Member Checking: Participants verified their interview transcripts and initial interpretations.
- Reflexivity: Researchers continuously engaged in reflexive journaling and memo-writing to surface and question their biases.
- Transferability: Thick descriptions of participants' roles, settings, and contexts were provided to allow assessment of applicability to other settings.

This multi-pronged approach ensured dependability, confirmability, and authenticity in capturing the nuanced experiences of EMR managers within complex health systems.

3. RESULT AND DISCUSSION

Participant Description

A total of 21 EMR managers participated in the study, representing 11 public and 10 private healthcare facilities across urban centers. Their experience in EMR system management ranged from 3 to 15 years, with an average of 7.8 years. Participants held roles such as Health Information Manager, IT Supervisor, Digital Transformation Officer, and Clinical Informatics Lead.

- Gender distribution: 13 males, 8 females
- Age range: 32–58 years

- Qualifications: All held at least a bachelor's degree in health informatics, IT, or health administration; 9 held a master's degree
- Geographic regions: Participants came from three major regional healthcare systems, each with different levels of digital maturity.

Emerging Themes

Thematic analysis of the interview data produced four major themes, each with subthemes. These themes capture both individual and organizational dynamics of interoperability challenges and EMR management.

Theme 1: The Fragmented Landscape of Interoperability

Subthemes:

- *"Data speaks different languages"*
- *"One hospital, five systems"*

Participants widely described incompatible systems that lacked shared standards for data formats or exchange protocols, even within the same institution.

"We use one EMR for radiology, another for labs, and yet another for patient records. None of them talk to each other." — *Participant 7, IT Manager*

"It's like trying to build a puzzle where the pieces were never meant to fit together." — *Participant 12, Digital Lead*

The fragmentation caused workflow disruptions, duplicated data entry, and increased reliance on manual workarounds like printing and scanning.

Theme 2: The Role Strain of EMR Managers

Subthemes:

- *"Caught between clinical needs and tech limitations"*
- *"Invisible leaders in a broken system"*

Many EMR managers felt under-resourced, under-trained, and under-recognized. Their position often lacked decision-making power, despite being at the operational core of EMR systems.

"We're expected to fix interoperability without having the authority to choose or integrate systems." — *Participant 4, Health Information Officer*

"I sit in meetings where clinicians demand seamless integration, but leadership doesn't understand what that takes." — *Participant 9, Clinical Informatics Manager*

This theme highlights a disconnect between technical knowledge and institutional power, leaving EMR managers feeling isolated.

Theme 3: Adaptive Strategies and Workarounds

Subthemes:

- *"We built bridges with duct tape"*
- *"Excel is our best friend"*

Participants shared inventive but unofficial methods to compensate for interoperability failures—ranging from Excel sheets for manual data merging to using API hacks, cloud drives, or shared email folders for transferring patient data between systems.

"We created a shadow system in Google Sheets just to track patient transfers between units." — *Participant 14, System Analyst*

"There's a shared folder all units use to drop and fetch PDFs. That's how referrals happen." — *Participant 18, EMR Lead*

These practices, though efficient in the short term, raised concerns about data security, compliance, and sustainability.

Theme 4: Systemic Barriers to Progress

Subthemes:

- *"Policy doesn't meet reality"*
- *"Vendors don't play nice"*

EMR managers pointed to vendor lock-in, lack of national data standards, and short-term policy cycles as structural barriers.

"Every time a new director comes in, the IT direction changes. There's no continuity." — *Participant 3, EMR Supervisor*

"We have the tech to integrate, but vendors refuse to share APIs unless we pay more." — *Participant 19, Hospital IT Director*

This theme speaks to the broader ecosystem in which interoperability struggles occur, revealing tensions between private interests, public needs, and organizational instability.

Interconnection of Themes

The themes are not isolated but interact in a dynamic and often cyclical pattern:

- Fragmentation (Theme 1) places operational stress on managers (Theme 2), prompting improvisational workarounds (Theme 3), which further entrench systemic inefficiencies (Theme 4).
- These layers compound over time, reinforcing a cycle of reactive problem-solving rather than long-term strategic integration.
- EMR managers emerge as critical "connectors" in the system, navigating between incompatible technologies, hierarchical gaps, and patient safety concerns.

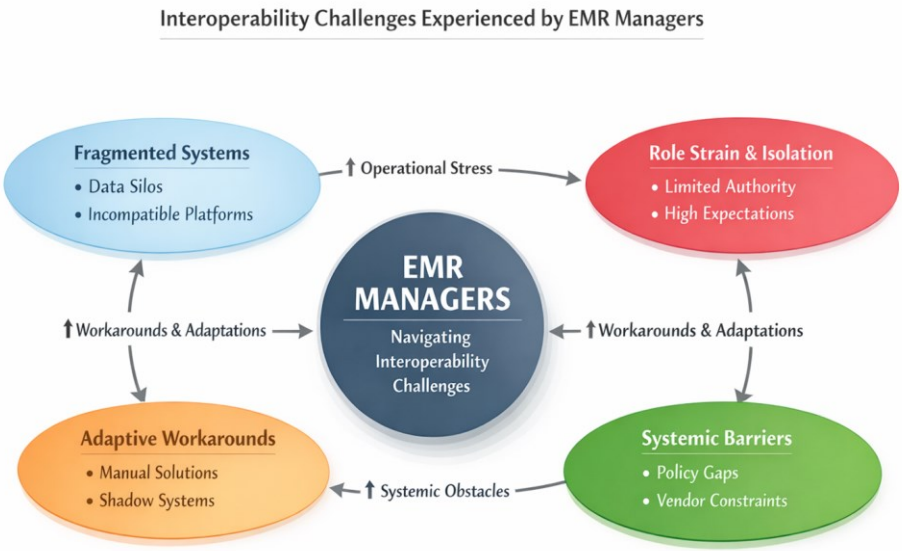
This conceptual interplay is visualized as a "feedback loop of fragmentation" where individual coping strategies mask deeper structural dysfunctions, thereby delaying reform.

Use of Multiple Data Sources

While semi-structured interviews were the primary method, participant documents such as internal SOPs, data flow charts, and system integration memos were also reviewed (in 8 of 21 cases). These documents corroborated claims about workarounds and illustrated fragmented infrastructures (e.g., disconnected modules for labs, pharmacy, and clinical notes).

Literature Integration

Emerging themes both align and extend prior literature. For instance, previous studies have documented technical challenges in EMR interoperability (*Mollabagher & Hassanzadeh, 2026*), but this study expands the understanding by revealing the emotional and relational labor EMR managers invest in keeping systems functional. Furthermore, the theme of adaptive strategies adds to the literature by showing how informal solutions become essential to sustaining workflows, despite being invisible in formal policy design.



Comparison with Existing Literature

This study contributes to a growing body of qualitative research on health system interoperability by centering the perspectives of Electronic Medical Records (EMR) managers, a group whose experiences have been largely underrepresented in previous studies. The findings align with, extend, and in some areas challenge existing literature and theoretical models.

First, consistent with the Socio-Technical Systems Theory (STS), the study confirms that interoperability challenges cannot be understood as purely technical. EMR managers described a dynamic interplay of technological fragmentation, organizational dysfunction, and human adaptation—validating the STS emphasis on the interdependence between technology, people, and structures (*Barbalho et al., 2026; Mollabagher & Hassanzadeh, 2026*).

The theme of "fragmented systems" echoes earlier reports identifying data silos and non-standardized architectures as major barriers to interoperability (*Putra et al., 2025; Simone et al., 2026*). However, unlike many technical evaluations, this study emphasizes how these challenges are felt and managed at the operational level by EMR managers. Their descriptions of multi-platform redundancies and lack of data visibility point to a systemic issue of digital incoherence, particularly in hospitals where multiple vendors and legacy systems coexist.

The theme “Role Strain and Isolation” adds new insight by exposing how EMR managers often operate at the intersection of clinical, administrative, and technical domains—yet without

formal authority or sufficient institutional support. This finding diverges from prior studies that have focused on clinicians' or CIOs' perspectives and suggests a missing middle in health information governance structures. It challenges the assumption that EMR issues are primarily resolved through policy or high-level planning and reveals the emotional and structural burden carried by mid-level managers.

Previous literature acknowledges workarounds in healthcare IT (*Ackermann et al., 2026*), but this study goes further by identifying a theme of "adaptive workarounds" that have become institutionalized coping mechanisms, such as using spreadsheets or shadow systems. These practices highlight a tension between innovation and risk, as they improve short-term functionality but undermine security, data integrity, and auditability—issues not fully addressed in earlier studies.

Finally, the theme "Systemic Barriers" aligns with findings on vendor resistance, inadequate policy enforcement, and lack of data standards (*Chandak & Chandak, 2026; Kilkenny & Burns, 2026*). However, our participants emphasized how policy volatility (frequent changes in leadership or national priorities) was just as disruptive as technical limitations—an underexplored issue in the literature. This insight expands the conceptual understanding of interoperability to include institutional instability as a technical barrier by proxy.

4. CONCLUSION

This study reveals that Electronic Medical Records (EMR) managers play a pivotal yet underappreciated role in navigating health system interoperability challenges. Through their lived experiences, the research highlights a complex ecosystem marked by fragmented technologies, limited authority, adaptive workarounds, and systemic policy barriers. EMR managers often serve as the invisible glue holding digital systems together, innovating within constraints to maintain functionality. The key takeaway is that achieving meaningful interoperability requires more than technical solutions—it demands empowering the people who manage these systems daily, addressing structural barriers, and fostering cross-level collaboration. Recognizing and supporting EMR managers as central actors in digital health transformation is essential for building resilient, integrated, and patient-centered healthcare systems.

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