

Conceptual Framework to Increase Electronic Medical Record (EMR) Adoption in India

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Title: Conceptual Framework to Increase Electronic Medical Record (EMR) Adoption in India

Introduction-

The adoption of Electronic Medical Records (EMRs) marks a pivotal shift in the healthcare realm, revolutionizing the way patient information is stored, accessed, and utilized by healthcare professionals worldwide. EMRs offer a comprehensive and efficient means of managing medical data, enhancing patient care, and streamlining healthcare processes. The COVID-19 pandemic highlighted the vital importance of having up-to-date information stored in Electronic Medical Records (EMRs), serving as a cornerstone for informed decision-making amidst crises. As healthcare systems strive to improve efficiency, reduce medical errors, and enhance patient outcomes, the adoption of EMRs emerges as a critical strategy.

India is actively pursuing initiatives to encourage EMR adoption and integrate digital health technologies into its healthcare landscape. The National Health Policy, 2017 emphasizes the importance of leveraging technology to enhance healthcare delivery, including the implementation of EMRs. Additionally, the National Digital Health Mission (NDHM) launched by the Government of India aims to create a digital healthcare ecosystem, facilitating the adoption of electronic health records (EHRs) across the country.

However, the widespread adoption of Electronic Medical Records (EMRs) encounters a notable challenge in tier 2 and tier 3 cities primarily due to a lack of awareness about EMRs among healthcare providers and patients alike. System Integrators (SIs) emerge as pivotal agents in addressing this gap, taking up the role of local champions. Beyond overcoming geographical constraints, SIs play a crucial role by providing essential implementation, technical, and training support to the hospital staff to utilize the EMR efficiently.

Functioning as intermediaries, SIs facilitate a seamless integration of EMR systems into healthcare facilities in these underserved regions. Their on-the-ground presence ensures hands-on assistance, leading to a better understanding and acceptance of EMR technology among hospital staff. This strategic involvement positions SIs as the bridge in overcoming barriers to adoption, contributing significantly to the increased utilization of EMRs across tier 2 and tier 3 cities.

In the attempt to build a robust Digital Health Infrastructure, pivotal role is played by the three major stakeholders (EMR Vendors, System Integrators and Healthcare Facilities) as significant contributors to surmounting obstacles to adoption and enhancing the utilization of Electronic Medical Records (EMRs) specifically in tier 2 and tier 3 cities.

Review of Literature

Title of Literature	Place	Objective	Findings
A case study of an EMR system at a large hospital in India: Challenges and strategies for successful adoption	India	An interpretive case study from a large eye hospital in India that has adopted an EMR system is presented. Some of the key challenges the hospital faced in trying to adopt the system include a fairly complicated organizational climate that included a wide range of expectations from the system from various stakeholders, and difficulty in identifying the correct design strategy	Despite the potential benefits, adopting EMRs in developing countries is not without obstacles. These Challenges arise from conflicting stakeholder demands, user doubt and limited IT abilities. These barriers can be surmounted by effective communication, involving users and paper-like interfaces that are easy to use by people with no computer literacy. Moreover, social and financial incentives can encourage acceptance of these systems as well as raising awareness for more computer applications programs.
Electronic Health Record Adoption In US Hospitals: Progress Continues, But Challenges Persist	US	To analyse trends in hospital adoption of Electronic Health Records (EHRs) in the US, focusing on progress made, remaining challenges, and areas needing further attention	Hospitals most often reported up-front and ongoing costs, physician cooperation, and complexity of meeting meaningful-use criteria as challenges. The nationwide hospital EHR adoption is in reach but will require attention to small and rural hospitals and strategies to address financial challenges, particularly now that penalties for lack of adoption have begun.
Technology Acceptance Model: A Case of Electronic Health Record in Estonia	Estonia	This study aimed to identify the key factors that motivate Estonian healthcare professionals to use the EMR/HER and to understand the activities undertaken by Estonia to encourage use of EMR Adoption.	- Psychological ownership played an important role in building positive attitude toward the Estonian EHR system. - Perceived ease of use played a role in influencing the attitude towards the system, and usage of the system. - Case supports perceived usefulness to have impact on attitude, and consequently, acceptance and usage levels in the Estonian EHR case.
The role of the electronic medical record (EMR) in care delivery development in developing countries: a systematic review	US	Most countries in Europe and the USA are increasingly using an electronic medical record (EMR) to help improve healthcare quality. Unfortunately, most developing countries face many challenges ranging from epidemics	The potential of EMR systems to transform medical care practice has been recognised over the past decades, including the enhancement of healthcare delivery and facilitation of decision-making processes. Some benefits of an EMR system include accurate medication lists, legible notes and prescriptions and immediately

		and civil wars to disasters: they also lack a robust healthcare infrastructure in the form of information and communications technology (ICT) to ensure continuity of patient health which many research studies consider a lifesaving resource. The aim of this systematic review is to examine the benefits of an EMR and its contribution to the development of healthcare delivery in developing countries.	available charts. Despite challenges facing the developing world such as lack of human expertise and financial resource, most studies have shown how feasible it could be with support from developed nations to design and implement an EMR system that fits into this environment.
EHRs: The Challenge of making Electronic Data Usable and Interoperable	US	This paper presents the legislative programs that encourage the implementation of EHRs and explores the barriers hampering interoperability.	• Meaningful use incentives significantly helped boost EHR adoption among physicians but at the same time negatively impacted the physicians themselves, reducing efficiency, adding to their clerical burden, and increasing the risk of professional burnout • The ONC predicted in its October 2015 report titled "Connecting Health and Care for the Nation: A Shared Nationwide Interoperability Roadmap" that achieving nationwide interoperability in the US health system would occur between 2021 and 2024 • Despite the potential for incentive payments, the financial costs of implementing EHRs remain a primary barrier to their adoption
Progress in electronic medical record adoption in Canada	Canada	To determine the rate of adoption of electronic medical records (EMRs) by physicians across Canada, provincial incentives, and perceived benefits of and barriers to EMR adoption.	Canadian physicians remain at the stage of EMR adoption. Progression in EMR use requires experienced, knowledgeable technical support during implementation, and financial support for the transcription of patient data from paper to electronic media. The interoperability of EMR offerings for hospitals, pharmacies, and clinics is the rate-limiting factor in achieving a unified EMR solution for Canada.

Overcoming Electronic Medical Records Adoption Challenges in Saudi Arabia	Saudi Arabia	This paper aims to conduct an in-depth literature review focusing on the challenges associated with the adoption of EMR in KSA. By examining technical, financial, human, cultural, and policy-related challenges, along with privacy and security issues, this study seeks to provide a comprehensive understanding of the obstacles hindering EMR adoption in the Saudi healthcare context. The ultimate goal is to offer insights that can aid policymakers, healthcare professionals, and stakeholders in developing effective strategies for successful EMR integration, advancing KSA's healthcare delivery system in alignment with Vision 2030.	This review finds that effectively integrating EMR systems in Saudi Arabia's healthcare requires a comprehensive strategy. This includes user-friendly EMR design, extensive training, strong privacy protection, and careful planning. The success of EMR implementation hinges on visionary leadership, collaboration among stakeholders, and adaptable approaches. By overcoming these challenges, Saudi Arabia can leverage EMR systems to significantly improve healthcare quality, efficiency, and achieve Vision 2030's healthcare goals.
Perceptions of Electronic Medical Records (EMR) Among Healthcare Professionals	US	This research explores the reasons behind this low level of usage of EMR, and investigates the potential effects of a particular information infrastructure on the level of patient satisfaction. Data was collected using online survey and personal interviews from eighteen health professionals.	The contribution of this research is a revised model of EMR adoption among health professionals in organizations providing patient care. The revised model generated by this research aims to provide focus areas for healthcare facilities which can be emphasized for better EMR adoption.
Success criteria for electronic medical record implementations in low-resource settings: a systematic review	US	Electronic medical record (EMR) systems have the potential of supporting clinical work by providing the right information at the right time to the right people and thus make efficient use of resources. This is especially important in low-resource settings where reliable data are also needed to support public health and local supporting organizations.	Highly reliable data handling methods, human resources and effective project management, as well as technical architecture and infrastructure are all key factors for successful EMR implementation.

		In this systematic literature review, our objectives are to identify and collect literature about success criteria of EMR implementations in low-resource settings and to summarize them into recommendations.	
Challenges for adoption of smart healthcare strategies: An Indian perspective	India	The National Digital Health Blueprint lays out the implementation framework for the National Health Stack (NHS). This blueprint takes into account the global best practices in adoption of smart or digital technologies. However, a clear assessment of the challenges in adopting smart healthcare strategies, especially in the Indian context is critical to the success of the ABDM. This review aims to fill this knowledge gap.	Challenges in Adoption: • Privacy and security issues • Data governance • Interoperability issues • Standards for data representation • Poor data quality • Functional and non-functional system issues • Costs • Urban and rural divide of trained/skilled healthcare workforce and infrastructure • Governance Challenges • End User Challenges • Organisational challenges
A perspective on digital Health Platform & its implementation at national level	India	This paper provides a perspective of the high blueprint of the DHP (Digital Health Platform), and its common components, and compare it with the rolled-out blueprint and plan of the National Digital Health Mission in India	This paper presents an approach to implementing DHP components in a layered, reusable, and holistic manner. A well-defined policy and technology principles with appropriate governance in place can help in providing a clear vision for implementing a DHP. A step-by-step approach to the adoption of digital health services is a feasible mechanism to avoid the burden of implementation. Countries promote incentive schemes for digital health adoption which many times pose challenges to the data quality. This necessitates the use and implementation of Information Quality Frameworks which is currently missing. While promoting adoption, appropriate majors must be taken to ensure the completeness and correctness of health records through certification schemes, MVP guidelines, IQ frameworks, etc. so that the data can be used for secondary healthcare purposes.

Theoretical/Conceptual Framework

The comprehensive engagement of hospitals with the Ayushman Bharat Digital Mission (ABDM) necessitates a series of significant undertakings related to Electronic Medical Records (EMR) adoption. The path to successful integration includes not only the hospital's receptiveness towards the incorporation of EMRs but also the ability to identify and select an ABDM-certified EMR system that aligns with their specific requirements. Additionally, it involves the seamless assimilation of the chosen EMR into the existing hospital system, the efficacious training of staff for optimal EMR utilization, and the continuous monitoring of its usage. However, a significant number of Indian hospitals face challenges due to limited resources and expertise, impeding their ability to adopt EMRs and participate fully in the ABDM ecosystem. In addition, most EMR product vendors in India are very small and don't have the go-to-market reach and resources needed to support a very diverse and distributed healthcare market in India. This inability to invest strongly further impedes the sale and deployment of EMR in the marketplace.

The proposed Conceptual framework aims to address these issues by engaging competent system integrators as "strategic partners". These partners will provide comprehensive EMR adoption support, including staff training, implementation assistance, and guidance on sustained application usage. By leveraging the expertise of these integrators, the framework plans to facilitate widespread EMR adoption, enabling hospitals to actively contribute to the ABDM initiative and advancing digital healthcare in India.

Research Gap

Limited research explores the effectiveness in building an ABDM-certified EMR ecosystem to increase adoption in India.

Selection of Pilot cities is random.

Research Questions

- What are the Challenges in EMR Adoption?
- How sustainable is the EMR adoption facilitated by the proposed framework in terms of ongoing maintenance, support, and integration with future advancements in digital health infrastructure?

Research Objectives

- To understand the challenges in EMR Adoption and strategic objectives that encapsulate its mission to accelerate EMR adoption and fortify digital health infrastructure across Indian healthcare facilities.
- To assess the long-term sustainability of EMR adoption facilitated by the proposed framework, which aim is to accelerate the integration of digital health solutions into India's healthcare ecosystem.

Methodology

This study will employ a qualitative approach which focused on data collected through in-depth interviews and the interactions carried out during field visits with the three principal stakeholders- EMR Vendors, System Integrators (SI) and Private Hospitals.

EMR Vendors - We reached out to more than 40 Electronic Medical Record (EMR) vendors, employing a **convenient sampling** method aligned with the requirements outlined for the selection criteria. Out of which 18 vendors have shown keen interest in the proposed framework and the opportunity, signifying a substantial resonance with our objectives. They have also addressed the current challenges faced in scaling the EMR Adoption.

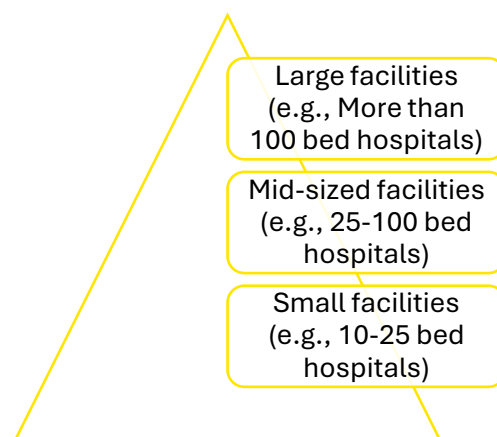
System Integrators (SI)- List of SIs was created through secondary research and data received from various governmental sources. The process of selection encompasses a thorough range of criteria and a scoring matrix to guarantee that the chosen SIs fulfil the program's requirements proficiently.

Criteria defining essential qualifications for system integrators. The crucial factors considered for selecting SIs are:

- Age of Company
- Line of Business
- Clientele
- Headquarters
- Number of Offices
- Number of employees
- Revenue of company

After the Selection of potential SIs, In-dept interviews and in-person consultations happened to understand their viewpoint on proposed framework and addressed their concerns.

Private Hospitals- Our strategic focus is directed towards the private hospital segment within Tier 2 and Tier 3 cities, with an emphasis on facilities having bed capacities ranging from 10 to 100 beds. The facilities are grouped into three categories:



We have compiled a comprehensive list of hospitals located in the identified pilot sites, utilizing public data repositories.

A hospital screening matrix has been developed based on criteria such as bed strength, the presence of a hospital website, hospital chain affiliation, and availability of HFR ID to screen the hospitals effectively. The highest score allocated in the matrix is 4.6. The hospitals are further grouped into four categories- Category A,B,C and D on the basis of their score.

The hospitals will be contacted in three phases based on their categorization.:

- In the first phase, hospitals in categories A and B will be contacted.
- In the second phase, hospitals in category C will be contacted.
- This will be followed by phase 3, during which hospitals in Category D will be contacted.

Pilot Sites	Category A	Category B	Category C	Category D	Total Count
	>4	>2 and <4	>1 and <2	<1	
Bhopal	0	62	72	69	203
Jaipur	2	67	96	63	228
Kochi	0	53	97	50	200
Bhubaneswar	0	24	65	31	120

The shortlisted hospitals will then be assessed to estimate their digital maturity using a digital maturity index.

We have reached out to 53 hospitals via telephonic calls and emails, and we have engaged in consultations with a total of 16 hospitals. Through these consultations, we have gathered key insights that formed our approach to address the unique needs and challenges prevalent in this healthcare landscape.

Plan of Analysis

The analysis will leverage a qualitative approach. Data from in-depth interviews and field visits with EMR vendors, system integrators (SIs), and private hospitals will be analysed to identify both commonalities and divergences in perspectives on EMR adoption across these stakeholder groups.

Insights received from each group will be used to refine the proposed framework. This framework refinement will ensure it addresses the specific needs and challenges identified for each stakeholder group, ultimately promoting broader aim.

Finally, a narrative synthesis will be developed. This synthesis will integrate the perspectives of all stakeholders and present a comprehensive picture of how the refined framework can contribute to sustainable EMR adoption within the targeted healthcare landscape.

Tentative Chapter Plan

1. Introduction and Background
2. Literature Review
3. Proposed Conceptual Framework
4. Research Methodology
5. Phasic Structured Approach to Pilot the proposed Framework
6. Implementation and Findings
7. Discussion, Conclusion, and Recommendations