" Electronic Medical Records: Evolution, Usability, Challenges, and Trends in Health Care Settings "

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ABSTRACT:

Background:

In recent years, the shift from traditional paper-based medical records to Electronic Health Records (EHRs) has transformed the landscape of healthcare documentation globally. This transition not only aims to enhance the efficiency of healthcare delivery but also seeks to improve the accuracy and accessibility of patient information. In Port Said, the integration of EHRs into health care settings affiliated with the Universal Health Insurance System marks a significant step towards modernizing healthcare infrastructure and optimizing patient care outcomes. Despite these advancements, the usability and satisfaction of healthcare professionals with EHR interfaces remain critical factors that influence the overall success of these systems. This paper explores the evolution, key challenges, and future trends of EHRs, with a particular focus on the experiences of healthcare providers in Port Said. Through this lens, we aim to provide a comprehensive overview of the impact of EHRs on patient care, data security, and the daily operations of health professionals, ultimately offering insights into the potential enhancements needed to meet the diverse needs of the healthcare ecosystem.(15 Years Later: The State of Electronic Health Records - Electronic Health Reporter n.d.; Cera 2023; Shen et al. 2025)

Background:

1. **History and Evolution of Electronic Health Records**

Electronic Health Records have transformed healthcare by transitioning patient data from traditional paper-based systems to sophisticated digital platforms. This shift has significantly increased the accessibility and management of patient information, meeting the growing needs of healthcare practitioners and their patients while reflecting ongoing technological advancements. (Canfell et al. 2024; Stoumpos, Kitsios, and Talias 2023)

The idea of EHRs emerged in the 1960s with initial efforts to convert medical records from paper to digital formats. Leading this early adoption were major institutions like the Mayo Clinic, which integrated electronic systems to streamline healthcare management. At that time, the high expense of computing technology limited the use of EHRs primarily to well-funded institutions and government initiatives. Originally, these systems were geared more towards handling administrative functions such as billing and appointment scheduling rather than supporting clinical operations. (Li et al. 2022)

During this era, Dr. Lawrence Weed introduced the Problem-Oriented Medical Record (POMR), a methodical way to record patient data. This system laid the groundwork for the development of modern EHR systems by promoting the systematic and comprehensive organization of medical information.(Rajaram et al. 2020)

During the 1990s, Electronic EHR technology experienced significant advancements, spurred by growing computational power and a recognized need for more efficient healthcare documentation. The Institute of Medicine's 1991 report, titled "The Computer-Based Patient Record: An Essential Technology for Health Care," underscored the crucial role of EHRs in enhancing the quality and efficiency of healthcare services.(Barker et al. 2024)

This period also witnessed the development of interoperability standards like Health Level Seven (HL7), which greatly enhanced the ability to share information across various EHR systems. In 2004, the United States created the Office of the National Coordinator for Health Information Technology (ONC) to foster the adoption of health IT. This initiative gained further support from the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which offered financial incentives to healthcare providers for the implementation of EHR systems. Collectively, these measures greatly accelerated the adoption of EHRs throughout the U.S. healthcare system. (Mennemeyer et al. 2016; Provenzano et al. 2024)

Currently, EHR systems are fundamental to healthcare, delivering much more than mere data storage. Modern EHRs enhance clinical decision-making, engage patients via online portals, and ensure seamless information flow across different healthcare providers. Their integration with artificial intelligence (AI) and machine learning (ML) technologies has broadened their applications, enabling advanced features like predictive analytics and tailored care plans.(Abedi et al. 2020)

Nevertheless, challenges such as data interoperability, cybersecurity risks, and ensuring user satisfaction remain prevalent. Initiatives to establish universal standards and improve the usability of EHR systems are essential in leveraging their full potential to enhance patient outcomes and the efficiency of healthcare services.(Carini et al. 2021)

2. Types of Electronic Health Record Systems

Electronic Health Record systems are fundamental to contemporary healthcare, streamlining the management of digital patient information. It's essential for healthcare providers to comprehend the different types of EHR systems available, ensuring they choose options that best meet their specific operational requirements and regulatory compliance needs.(Gurupur et al. 2024)

Selecting the right EHR system requires a detailed assessment of various factors including the size of the practice, specific needs related to medical specialties, budget limitations, and the requirement for system interoperability. It is crucial to evaluate the scalability of the system, the customization options it offers, the robustness of its data security measures, and the level of support provided by the vendor. Involving key stakeholders in the decision-making process and conducting comprehensive needs assessments are essential steps to ensure the chosen EHR system boosts operational efficiency and enhances patient care outcomes. (Al Ani et al. 2022)

2.1. On-premise vs. cloud-based systems.

On-premises EHR systems are hosted on an organization's own servers, providing them with complete control over data management and security. This arrangement supports extensive customization to align with specific organizational processes. However, on-premises systems involve considerable initial investments for hardware and entail ongoing maintenance costs, including the need for dedicated IT support. Challenges such as scaling the system and providing remote access can also arise without the appropriate technical setups. (Fernández-Cardeñosa et al. 2012; Johnson et al. 2019)

Cloud-based EHR systems are hosted on external servers and can be accessed through the internet, which provides significant flexibility and scalability. These systems generally require lower upfront investments and minimize the burden of in-house IT maintenance, as the service provider handles updates and security. Cloud-based systems also support remote access, facilitating improved coordination of care across various locations. However, their performance is contingent upon reliable internet connectivity, and they may prompt concerns about data security and adherence to privacy regulations.(Fernández-Cardeñosa et al. 2012; Johnson et al. 2019)

2.2. Open-source vs. proprietary EHR platforms.

Open-source EHR platforms grant healthcare organizations the ability to modify their systems by providing access to the source code. This customization potential can be a significant advantage, often resulting in cost savings due to low or absent licensing fees. However, deploying open-source EHR solutions generally demands considerable technical knowledge and resources to ensure proper customization, integration, and ongoing management. Popular examples of open-source EHR systems include Open EMR and Open MRS. (Carini et al. 2021)

Proprietary EHR platforms are created and maintained by specific vendors, ensuring thorough support and frequent updates. These systems typically offer advanced features and intuitive interfaces, yet they may lack flexibility when it comes to customization. Moreover, proprietary EHRs usually incur higher costs due to licensing fees and might result in vendor lock-in, making it challenging to switch to alternative systems in the future. (Carini et al. 2021)

2.3. Integrated Health Management vs. Standalone EHR Systems

Some EHR solutions extend beyond basic electronic health records to integrate with broader health management systems that include functionalities like practice management, billing, and patient engagement. These integrated systems are designed to streamline all aspects of healthcare delivery within a unified platform, enhancing operational efficiency and ensuring cohesive management of data. While these

comprehensive systems offer robust capabilities, they may also introduce greater complexity and higher costs. (Rajaram et al. 2020)

Standalone EHR systems function independently and are not integrated with other healthcare technologies, making them particularly well-suited for smaller medical practices that need basic EHR functionalities without requiring advanced features or broad interoperability. These systems are cost-effective and simple to use, though they may restrict seamless information sharing across various healthcare environments.(Provenzano et al. 2024)

2.4. Other EHR Platforms

Specialized EHR systems are customized to address the distinct needs of various medical specialties such as pediatrics, radiology, or oncology. These systems are equipped with specific features and templates that are designed to optimize workflows relevant to each specialty, thereby improving the efficiency and precision of medical documentation. For example, an EHR system designed for radiology may incorporate sophisticated imaging capabilities, while one intended for pediatrics might feature tools for tracking growth charts and vaccinations.(Abedi et al. 2020)

Hybrid EHR systems blend features from both on-premises and cloud-based models, capitalizing on the strengths of each. This hybrid approach enables the storage of crucial data on local servers, enhancing security, while allowing less sensitive information to be handled in the cloud, thus improving accessibility and facilitating collaboration. Although hybrid systems provide a comprehensive solution, they can introduce complexities in integration and management, requiring careful handling to balance the benefits and challenges. (Provenzano et al. 2024)

With the rise of mobile technology in healthcare, mobile EHR systems have become crucial for providing healthcare providers with access to patient records on the move. These systems allow medical professionals to access and update patient information via smartphones or tablets, enhancing the speed and quality of decision-making across different care environments. However, it is essential to address challenges such as securing data and ensuring consistent functionality across various mobile devices to maintain the integrity and effectiveness of these systems.(Mennemeyer et al. 2016)

3. **EHR Implementation Challenges**

The deployment of HER systems involves navigating a range of challenges that can hinder their effective adoption and use. These challenges typically include technical difficulties, financial constraints, and reluctance or resistance from healthcare providers. Each of these areas requires careful consideration and strategic planning to ensure a successful implementation of EHR systems in healthcare settings.(Provenzano et al. 2024; Tsai et al. 2020)

3.1. Technical issues

Interoperability, defined as the capability of diverse EHR systems to seamlessly communicate and exchange data, poses a substantial technical challenge. The absence of uniform data formats and protocols often results in fragmented information, which can disrupt coordinated patient care. Recent studies consistently identify issues with interoperability as one of the primary obstacles during the implementation of EHR systems. (Adler-Milstein, Kvedar, and Bates 2014)

Scalability is a critical concern for expanding healthcare organizations that rely on EHR systems. These systems must be capable of managing increasing amounts of patient data efficiently without degrading in performance. If scalability is not adequately addressed, it can result in system delays and data congestion, which negatively impact clinical workflows and patient care. Research underlines the importance of

scalability as an essential factor for the long-term viability of EHR implementations.(Feldman, Buchalter, and Hayes 2018)

3.2. Financial barriers

The costs associated with implementing HER systems are significant, encompassing the purchase of software and hardware, staff training, and potential disruptions to existing workflows during the transition. These financial demands can be particularly challenging for smaller healthcare practices with limited budgets. Recent studies have indicated that the high cost associated with EHR systems poses a substantial barrier to their adoption, especially for financially constrained institutions.(Gans et al. 2005)

After the initial setup, the ongoing maintenance costs for Electronic Health Record (EHR) systems also present financial challenges. These costs can include expenses for software updates, technical support, and system upgrades, which may accumulate and significantly strain financial resources over time. Continuous funding is essential for maintaining the efficiency and smooth operation of EHR systems, as underscored by recent research findings. Sustained investment ensures that the systems stay up-to-date and functional, supporting the healthcare provider's ability to deliver quality care. (Kruse et al. 2018)

3.3. Resistance Among Healthcare Providers.

Resistance to change remains a prevalent challenge in the adoption of EHR systems. Many healthcare providers, accustomed to traditional paper-based methods, may hesitate to embrace digital records due to concerns about an increased workload or potential declines in efficiency. Recent studies highlight staff resistance as a significant factor contributing to delays in the successful implementation of EHR systems. Overcoming this barrier requires targeted strategies to address fears and demonstrate the value of EHR systems to clinical workflows. (McGinn et al. 2011)

Comprehensive training is a vital component for the successful adoption of EHR systems. Inadequate training often results in user frustration and errors, which can intensify resistance among healthcare providers. Research emphasizes that closing training gaps and offering continuous support are critical measures to reduce resistance and ensure that providers feel confident and capable when using the system. Proper training not only improves user satisfaction but also enhances overall efficiency and accuracy in EHR utilization. (Buntin et al. 2011)

3.4. Achieving Seamless Data Exchange

Achieving seamless data exchange in healthcare continues to face significant challenges, including inconsistent data standards, privacy concerns, and outdated legacy systems that struggle to integrate with modern technologies. The customization of HL7 and the limited universal adoption of FHIR contribute to fragmented data ecosystems, creating persistent information silos. A comprehensive study identifies these issues as major obstacles to achieving full interoperability within the healthcare sector.(Kuhn et al. 2015)

3.5. Balancing Access and Privacy

Striking a balance between data accessibility and privacy protection is essential for preserving patient trust while fostering innovation in the healthcare sector. Achieving this equilibrium is critical to ensuring the ethical management and use of sensitive health information.(10 Healthcare Data Compliance Regulations You Should Know n.d.)

4. Strategies to overcome faced challenges

Overcoming technical challenges in HER systems necessitates the implementation of standardized data formats to improve interoperability and the development of scalable infrastructure to support future expansion. Close collaboration with EHR vendors is crucial to ensure compatibility and scalability across systems. Research underscores the importance of providing robust technical support as an effective strategy to

address these challenges, facilitating smoother implementation and ongoing system performance. (Griesser and Bidmon 2022)

To overcome financial obstacles in adopting EHR systems, healthcare organizations can take advantage of government incentives and grants designed to encourage EHR implementation. Performing a thorough cost-benefit analysis and carefully budgeting for both upfront and ongoing expenses are essential strategies. Recent studies advocate for meticulous financial planning to ensure the long-term sustainability and success of EHR systems in healthcare practices. (Esmaeilzadeh et al. 2015)

Involving healthcare providers in the process of selecting and customizing EHR systems can help cultivate a sense of ownership and decrease resistance to adoption. Offering thorough training and clearly illustrating the potential benefits of EHRs, such as improved patient care, can further motivate acceptance among users. Research highlights that effectively addressing behavioral resistance is a critical factor in ensuring the successful implementation of EHR systems. (Rahurkar, Vest, and Menachemi 2015)

The healthcare sector needs to continually adapt its strategies to safeguard against data breaches and meet strict regulatory requirements. This involves embracing advanced technologies and cultivating a culture of security awareness within organizations to strengthen overall data protection measures. (Navigating Healthcare Data Security Needs in 2025 | Ping Identity n.d.)

5. Impact of EHRs on Patient Care

Over the past decade, EHRs have profoundly impacted healthcare delivery by improving the accuracy and accessibility of patient records. These advancements have not only reduced medical errors but also enhanced care coordination, resulting in improved patient outcomes and more efficient healthcare services.(Burns 2023)

5.1. Improved Accuracy and Accessibility of Medical Records

EHRs have simplified the management of patient data by ensuring that accurate and up-to-date records are easily accessible to authorized healthcare providers. This improved accessibility supports prompt decision-making and strengthens continuity of care. Research published in *JAMA Network Open* in 2019 highlighted that EHR systems enhance the accuracy and availability of medical records, significantly reducing the loss of information during patient transitions.(Holmgren et al. 2024a)

5.2. Reduction in Medical Errors

The digitization of health records has played a crucial role in minimizing medical errors, especially in medication prescribing and administration. EHRs offer clinical decision support features, including automated alerts for potential drug interactions and allergies, which assist clinicians in making safer and more informed prescribing decisions. A systematic review found that EHRs reduce prescription errors by up to 50%, underscoring their significant contribution to improving patient safety. (Palen et al. 2012)

5.3. Enhancements in Patient Outcomes and Care Coordination

EHRs enhance care coordination by enabling seamless sharing of patient information across various healthcare settings. This connectivity fosters comprehensive care planning and minimizes unnecessary tests and procedures. Studies highlighted that interoperable EHR systems significantly improve patient safety and care coordination, especially within large healthcare networks.(Kruse et al. 2018)

6. Interoperability and Data Sharing in Healthcare

Interoperability and efficient data sharing are essential elements of contemporary healthcare systems. They enable seamless communication between various health information technologies, which plays a pivotal role in enhancing patient outcomes and ensuring more coordinated and effective care delivery. (Scheibner et al. 2021)

6.1. Standards for Interoperability

Health Level Seven (HL7) and Fast Healthcare Interoperability Resources (FHIR) are two leading standards that enhance the interoperability of health information systems. HL7 accommodates diverse healthcare data formats and is widely recognized worldwide, facilitating effective data sharing among healthcare providers and organizations. FHIR, building on HL7, is specifically designed to simplify and improve interoperability. It supports real-time data exchange and is optimized for web applications. Utilizing modern web technologies, FHIR has become instrumental in integrating mobile applications, sharing data from wearable devices, and offering APIs for third-party healthcare solutions. (Bender and Sartipi 2013)

Adopting interoperability standards such as HL7 and FHIR presents significant technical and regulatory hurdles. Healthcare organizations must address intricate integration processes while adhering to strict data protection regulations. These efforts can be both expensive and time-intensive, requiring careful planning and resource allocation to achieve successful implementation.(Ayatollahi, Hosseini, and Hemmat 2019)

6.2. The Role of EHRs in Telemedicine and Remote Patient Monitoring

EHRs are being progressively integrated with telemedicine platforms and remote patient monitoring tools, playing a critical role in ensuring continuity of care. This integration is especially valuable in rural or underserved regions with limited access to healthcare services. By leveraging standards like FHIR, EHRs enable real-time access to patient data across various care settings, enhancing the effectiveness of telemedicine consultations and facilitating the management of chronic conditions remotely. (Black et al. 2011)

Improved interoperability and effective data sharing have proven to greatly enhance patient safety and care coordination. Accurate sharing of patient information across platforms and providers helps reduce medical errors and elevates the overall quality of care. Research shows that interoperability can lower readmission rates and boost diagnostic accuracy by equipping clinicians with comprehensive and accessible patient data.(DesRoches et al. 2013)

The outlook for healthcare data interoperability is optimistic, driven by continuous advancements in technology and evolving policy frameworks. Innovations in artificial intelligence (AI) and machine learning are anticipated to expand the capabilities of interoperable systems, facilitating more predictive and personalized healthcare. Additionally, ongoing policy reforms focused on encouraging data sharing are expected to enhance interoperability across healthcare systems, paving the way for more integrated and efficient care delivery.(Jha et al. 2009)

7. Privacy and Security Concerns

The Health Insurance Portability and Accountability Act (HIPAA) Security Rule, originally implemented in 1996, is undergoing substantial updates to address contemporary technological advancements and emerging cybersecurity threats. These revisions are designed to strengthen security measures within healthcare organizations and emphasize HIPAA's continued importance in protecting sensitive patient information. (HIPAA Rules Update Proposed to Combat Healthcare Data Breaches - Infosecurity Magazine n.d.; Safeguarding Health Information: Takeaways from HHS and NIST 2024 HIPAA Security Conference | Insights | Holland & Knight n.d.)

The General Data Protection Regulation (GDPR) has significantly shaped data privacy standards across the European Union (EU), emphasizing key principles like informed consent and the "right to be forgotten." These regulations place strict obligations on healthcare organizations within the EU, enforcing compliance through the potential imposition of substantial penalties for violations. (Discussing new data security trends with new key developments | Security News n.d.)

The Health Information Technology for Economic and Clinical Health (HITECH) Act builds upon the provisions of HIPAA by advancing the adoption of health information technology and enforcing stricter requirements for breach notifications. This legislation strengthens the protection of patient data while increasing the accountability of healthcare providers in maintaining data security and compliance. (Discussing new data security trends with new key developments | Security News n.d.)

The California Consumer Privacy Act (CCPA) represents a significant shift toward stricter data privacy measures, mandating that healthcare organizations transparently disclose their data collection practices and provide options for data deletion. This legislation is part of a growing trend in state-level regulations aimed at enhancing privacy protections across various industries, including healthcare. (Discussing new data security trends with new key developments | Security News n.d.)

The increasing prevalence of sophisticated ransomware attacks underscores the critical need for healthcare organizations to implement advanced security frameworks such as zero trust architectures. These systems operate on the principle that breaches are inevitable, requiring continuous verification of all network activities to mitigate potential threats effectively.(Security Breaches in Healthcare in 2023 n.d.)

Differential privacy enables the analysis of aggregated data while safeguarding individual identities, striking a balance between protecting patient privacy and leveraging the benefits of data-driven insights. This technology is essential for maintaining confidentiality without hindering the ability to conduct meaningful and impactful research. (Discussing new data security trends with new key developments | Security News n.d.)

Continuous monitoring of data activity and potential threats is vital for healthcare organizations, enabling the prompt detection and mitigation of any unusual or suspicious behavior. This proactive strategy plays a crucial role in preventing major data breaches and safeguarding sensitive patient information.(Navigating Healthcare Data Security Needs in 2025 | Ping Identity n.d.)

Managing the intricate framework of privacy regulations demands that healthcare organizations adopt a strategic approach to compliance. This involves conducting regular risk assessments and making necessary policy adjustments to maintain consistent alignment with evolving regulatory requirements.(10 Healthcare Data Compliance Regulations You Should Know n.d.; Discussing new data security trends with new key developments | Security News n.d.)

8. Role of EHRs in Public Health

EHRs play a crucial role in epidemiological research by providing comprehensive data that supports the analysis of disease patterns, the evaluation of interventions, and the assessment of health trends across populations. EHRs include both structured and unstructured data, such as demographic, diagnostic, and treatment information, which enable a wide range of health studies. These insights are essential for effective public health management and decision-making.(Tsiampalis and Panagiotakos 2023)

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EHRs have played a vital role in disease surveillance, as demonstrated during the COVID-19 pandemic. Networks such as the National Patient-Centred Clinical Research Network (PCORnet) have leveraged enhanced data-refreshing capabilities to enable real-time monitoring and rapid responses in health emergencies. This adaptability and the ability to deliver timely data are essential for tracking disease spread

and effectively managing public health responses during crises. (PCORnet. Public Health Surveillance in Electronic Health Records: Lessons From PCORnet. 2020. Available from - Search n.d.)

The integration of EHRs with national health registries significantly improves care continuity and quality. This connection enables the seamless exchange of information across various healthcare settings, enhancing disease surveillance, patient monitoring, and the management of public health initiatives. Such interoperability is crucial for building comprehensive epidemiologic cohorts and facilitating large-scale health research to inform public health strategies.(Williams 2021)

The integration of AI into the analysis EHRs has unlocked new opportunities in health research, particularly through the development of predictive models using extensive and diverse datasets. AI techniques, such as machine learning, enable the extraction of valuable insights from EHR data, which are essential for understanding complex medical conditions and enhancing the effectiveness of healthcare delivery.(Knevel and Liao 2023)

EHRs have a profound impact on healthcare delivery by supporting clinical decision-making and contributing to better patient outcomes. Their ability to facilitate real-time sharing and access to patient data promotes improved collaboration among healthcare providers, ensuring that patient care is more coordinated and delivered efficiently. (Holmes et al. The impact of electronic health records on healthcare delivery and patient outcomes: A review. WJARR. 2023 - Search n.d.)

9. Usability and User Experience in EHRs

The design of EHR interfaces presents notable challenges that affect their usability and effectiveness in clinical environments. Research highlights problems such as complicated navigation systems and an excessive number of clicks, both of which increase cognitive load and contribute to user frustration. These issues can hinder the overall efficiency and adoption of EHR systems in healthcare settings. (Ahmed et al. 2011; Edwards et al. 2008)

Studies indicate a significant link between the usability of EHRs and physician burnout. EHR systems that are complex and difficult to use contribute greatly to stress and dissatisfaction among healthcare providers, ultimately resulting in higher burnout rates. (Holmgren et al. 2024b; Sinsky et al. 2016)

Future developments in EHR design are focusing on user-centred approaches. By integrating feedback from healthcare providers and applying human factors engineering principles, the goal is to create more intuitive and efficient EHR systems. These advancements aim to improve user satisfaction and streamline clinical workflows, making EHRs easier to use and more effective in supporting healthcare delivery.(Ratwani et al. 2018; Tory and Möller 2004)

10. EHRs and Artificial Intelligence

The incorporation of AI into EHR systems is strengthening clinical decision support by offering healthcare providers actionable insights based on intricate data analyses. This integration helps improve both the accuracy and efficiency of patient care, enabling more informed decision-making and better outcomes.(Ancker et al. 2006; West, Borland, and Hammond 2015)

Predictive analytics in EHR systems utilize AI to improve patient care by forecasting health outcomes and tailoring treatment plans to individual needs. This technology allows healthcare providers to manage patient health proactively, leading to better clinical outcomes and more personalized care. (Ancker et al. 2006; West, Borland, and Hammond 2015)

As AI becomes increasingly integrated into EHR systems, it raises important ethical issues, such as concerns regarding data privacy and the risk of biases in algorithmic decision-making. Addressing these

ethical challenges is vital for ensuring continued trust in AI-driven healthcare systems and ensuring that they are used responsibly and equitably. (Ancker et al. 2006; West, Borland, and Hammond 2015)

11. Future Trends in EHRs

Technological advancements, including blockchain and the Internet of Things (IoT), are set to revolutionize EHR systems. These innovations enhance data security and enable real-time health monitoring, which in turn improves the quality of patient care and facilitates more efficient healthcare delivery. (Ratwani et al. 2018; Tory and Möller 2004)

There is a growing shift toward patient-centred EHRs that provide patients with greater access to their health records and actively involve them in their healthcare decisions. This trend is anticipated to enhance patient engagement and lead to improved health outcomes overall. (Ratwani et al. 2018; Tory and Möller 2004)

As healthcare transitions to value-based care models, EHRs are becoming increasingly essential. They play a key role in supporting these models by facilitating efficient data management and tracking outcomes, which ultimately enhances the quality and cost-effectiveness of healthcare delivery. (Ratwani et al. 2018; Tory and Möller 2004)

Current situation in Egypt and Port-Said governorate

Egypt's healthcare sector is undergoing a transformative digital overhaul led by the Egypt Healthcare Authority, particularly through the implementation of EHRs under the universal health insurance framework. Millions of EHRs have been created to date, enhancing the management of health services and enabling informed decision-making. This initiative is a part of a strategic plan to establish a unified system for electronic medical records across all healthcare facilities, ensuring secure and efficient data sharing nationwide. (Abd, A., and M. 2017; Egypt Healthcare - The Egypt Healthcare Authority highlights the pillars of digital transformation and telemedicine in the provinces under the universal health insurance system. n.d.)

The Ministry of Health and Population is spearheading efforts to automate hospitals through a centralized electronic platform. This project aims to integrate healthcare facilities across the country, facilitating seamless data exchange and expanding access to medical services. The initiative, which is expected to be completed by the end of 2023, is supported by comprehensive training programs designed to equip healthcare professionals with the necessary skills to manage and operate these digital systems effectively. (Egypt to automate hospitals via central electronic system by end of 2023 - EgyptToday n.d.; eHealth delivers 3 projects for digital transformation of Universal Health Insurance System in 2023 - Dailynewsegypt n.d.)

Port Said, as a model city for digital healthcare innovation, has made substantial progress in adopting advanced health technologies. Its hospitals and health centres are among the first to achieve full EHR integration, significantly reducing administrative burdens and improving patient care. The city has also received focused investments in healthcare infrastructure and personnel training, establishing it as a benchmark for other governorates. Digital platforms such as HealthTag have played a critical role in providing patients in Port Said and beyond with secure, accessible health data, further supporting the city's health transformation. (Egypt to automate hospitals via central electronic system by end of 2023 - EgyptToday n.d.; HealthTag | First Health Information Exchange Platform in Egypt n.d.; Planning Ministry Allocates EGP 31 Billion for Port Said Development in 2023/2024 n.d.)

The broader strategy for EHR adoption in Egypt includes the integration of telemedicine, remote diagnostics, and advanced data analytics platforms, which aim to streamline healthcare services and enhance patient satisfaction. These efforts are part of the country's overarching digital transformation strategy, aligned

with Vision 2030. Additionally, initiatives such as the deployment of specialized health data platforms and interactive dashboards demonstrate the government's commitment to leveraging innovative technologies to improve healthcare efficiency. (Abd, A., and M. 2017; eHealth delivers 3 projects for digital transformation of Universal Health Insurance System in 2023 - Dailynewsegypt n.d.; HealthTag | First Health Information Exchange Platform in Egypt n.d.)

Despite the progress, challenges remain in implementing a comprehensive EHR system nationwide. Ensuring robust data privacy and security, addressing resistance among healthcare providers, and maintaining system integrity are key concerns. However, Egypt's sustained efforts in digital innovation, infrastructure development, and workforce training underscore its dedication to building a modern, efficient healthcare system that meets the needs of its population.(Egypt Healthcare - The Egypt Health Care Authority Chairman meets with the Huawei delegation to discuss aspects of cooperation that can enhance the digitization of medical services and health care technology. n.d.; Egypt Healthcare - The Egypt Healthcare Authority highlights the pillars of digital transformation and telemedicine in the provinces under the universal health insurance system. n.d.; Egypt to automate hospitals via central electronic system by end of 2023 - EgyptToday n.d.; eHealth n.d.; HealthTag | First Health Information Exchange Platform in Egypt n.d.; Mennemeyer et al. 2016)

Conclusion

The evolution of Electronic Health Records (EHRs) has revolutionized healthcare by improving data accessibility, enhancing clinical workflows, and advancing patient care. From the early stages of digital health records to the current integration of interoperable systems, EHRs have become indispensable in modern healthcare. However, their widespread adoption is not without challenges, including technical barriers, financial constraints, and resistance from healthcare providers. Despite these obstacles, EHRs continue to demonstrate significant benefits, such as improved accuracy in medical documentation, reduced errors, and enhanced coordination of patient care.(Abd, A., and M. 2017; Future of EHR/EMR | 2025 EMR/EHR Trends n.d.)

In Egypt, the implementation of EHRs under the universal health insurance system highlights the nation's commitment to modernizing healthcare. Progress has been made in creating a unified platform to integrate health records across facilities, improving the quality and efficiency of care delivery. Port Said, as a model city, exemplifies these advancements, showcasing the potential for nationwide adoption of digital health solutions.(Abd, A., and M. 2017; Tsai et al. 2020)

Looking forward, the future of EHRs will likely be shaped by trends such as enhanced interoperability, the integration of artificial intelligence for predictive analytics, and strengthened data security measures. These innovations will further cement the role of EHRs in advancing global healthcare systems. Overcoming existing challenges and leveraging emerging technologies are essential for maximizing the potential of EHRs in delivering equitable and efficient healthcare.(Future of EHR/EMR | 2025 EMR/EHR Trends n.d.; Tsai et al. 2020)

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