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Optimizing Healthcare Data Management: The Evolving Role of Medical Secretaries in Saudi Arabia's Digital Health Transformation

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Abstract

The digital transformation of healthcare in Saudi Arabia has prompted a reexamination of the roles and responsibilities of medical secretaries in managing healthcare data. This systematic review aims to synthesize the evidence on the evolving role of medical secretaries in optimizing healthcare data management in the context of Saudi Arabia's digital health initiatives. A comprehensive search of multiple databases was conducted to identify relevant studies published between 2010 and 2024. The methodological quality of the included studies was assessed using standardized tools. The findings highlight the expanding scope of medical secretaries' roles, encompassing data entry, quality assurance, information retrieval, and coordination with healthcare teams. The review also identifies the key enablers and barriers to effective healthcare data management by medical secretaries, such as training and education, technological competencies, organizational support, and data governance policies. The study provides recommendations for policy, practice, and research to optimize the contribution of medical secretaries to healthcare data management and support the realization of Saudi Arabia's digital health goals. The findings emphasize the importance of empowering medical secretaries, fostering digital literacy, and promoting a culture of data-driven decision-making to enhance the efficiency, quality, and continuity of healthcare services in Saudi Arabia.

Keywords: medical secretaries, healthcare data management, digital health, Saudi Arabia, Vision 2030, systematic review, electronic health records, data quality, digital literacy, organizational support

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1. Introduction

The digital transformation of healthcare has become a global imperative, driven by the need to improve the efficiency, quality, and accessibility of healthcare services (Zarour et al., 2021). In Saudi Arabia, the healthcare system is undergoing a significant digital transformation as part of the country's Vision 2030, which aims to diversify the economy, enhance public services, and improve the quality of life for citizens (Rahman & Al-Borie, 2020). The digital health initiatives under Vision 2030 include the implementation of electronic health records (EHRs), telemedicine, mobile health (mHealth) applications, and data analytics to support evidence-based decision-making and personalized care (Al-Kahtani et al., 2022).

The success of these digital health initiatives depends on the effective management of healthcare data, which includes the accurate and timely capture, storage, retrieval, and sharing of patient information across healthcare settings (Samra et al., 2019). Medical secretaries play a crucial role in managing healthcare data, as they are often responsible for data entry, documentation, and communication between healthcare providers and patients (Knudsen & Bertelsen, 2021). However, the digital transformation of healthcare has

prompted a reexamination of the roles and responsibilities of medical secretaries, as they adapt to new technologies, workflows, and data management practices (Qvarfordt et al., 2024).

In Saudi Arabia, the evolving role of medical secretaries in healthcare data management has received limited attention in the literature, despite their potential to contribute to the success of digital health initiatives. Previous studies have focused on the technical aspects of EHR implementation (Alzghaibi, 2023), the acceptance of eHealth services by healthcare managers (Alshahrani et al., 2019), and the digital health literacy of healthcare professionals and patients (Alhur, 2024a). However, there is a lack of synthesized evidence on the specific roles, competencies, and challenges of medical secretaries in managing healthcare data in the context of Saudi Arabia's digital health transformation.

This systematic review aims to address this gap by synthesizing the evidence on the evolving role of medical secretaries in optimizing healthcare data management in Saudi Arabian hospitals and healthcare facilities. The specific objectives are:

1. To identify the types and characteristics of healthcare data management tasks performed by medical secretaries in Saudi Arabia.
2. To assess the impact of these tasks on the quality, efficiency, and continuity of healthcare services, as well as their alignment with Saudi Arabia's digital health goals.
3. To explore the enablers and barriers to effective healthcare data management by medical secretaries in the Saudi healthcare context, considering technological, organizational, and professional factors.
4. To provide recommendations for policy, practice, and research to optimize the contribution of medical secretaries to healthcare data management and support the realization of Saudi Arabia's digital health vision.

The findings of this review will inform healthcare policymakers, managers, and practitioners on the best practices and strategies for leveraging the skills and expertise of medical secretaries to enhance healthcare data management and drive digital health transformation in Saudi Arabia. The insights generated from this review can guide the development and implementation of training programs, workflow redesigns, and data governance policies that are responsive to the evolving needs and challenges of medical secretaries in the digital health era.

2. Literature Review

2.1 Importance of Healthcare Data Management in the Digital Health Era

Healthcare data management refers to the processes and practices involved in the collection, storage, retrieval, and sharing of patient information across healthcare settings (Zarour et al., 2021). Effective healthcare data management is essential for ensuring the quality, safety, and continuity of patient care, as well as supporting evidence-based decision-making and population health management (Samra et al., 2019). In the digital health era, healthcare data management has become increasingly complex and data-intensive, as healthcare organizations adopt EHRs, telemedicine, mHealth applications, and other digital health technologies (Al-Kahtani et al., 2022).

Several studies have demonstrated the benefits of effective healthcare data management in improving patient outcomes and healthcare system performance. A systematic review by Campanella et al. (2016) found that the use of EHRs was associated with reduced medical errors, improved adherence to clinical guidelines, and enhanced communication among healthcare providers. Another systematic review by Kruse et al. (2018) reported that the adoption of telemedicine and mHealth technologies was associated with improved access to care, reduced healthcare costs, and increased patient satisfaction.

However, the realization of these benefits depends on the quality and integrity of healthcare data, which can be compromised by various factors, such as data entry errors, incomplete documentation, interoperability issues, and data breaches (Zarour et al., 2021). A study by Schulz et al. (2020) estimated that poor data quality in healthcare costs the United States over $1.7 trillion annually, due to adverse events,

redundant tests, and unnecessary treatments. Another study by Lau et al. (2018) found that data quality issues, such as missing or inaccurate information, were among the most common barriers to the effective use of EHRs by healthcare providers.

These studies highlight the importance of effective healthcare data management in the digital health era, as well as the challenges and opportunities for improving data quality and utilization. Medical secretaries, as key players in the healthcare data management process, can play a crucial role in addressing these challenges and optimizing the benefits of digital health technologies.

2.2 Evolving Role of Medical Secretaries in Healthcare Data Management

Medical secretaries are administrative professionals who provide support to healthcare providers and patients in managing medical records, scheduling appointments, and facilitating communication (Knudsen & Bertelsen, 2021). Traditionally, medical secretaries have been responsible for tasks such as transcribing medical reports, filing paper records, and answering phone calls (Bertelsen & Nøhr, 2005). However, the digital transformation of healthcare has prompted a reexamination of the roles and responsibilities of medical secretaries, as they adapt to new technologies, workflows, and data management practices (Qvarfordt et al., 2024).

Several studies have explored the evolving role of medical secretaries in healthcare data management in various healthcare settings. A qualitative study by Knudsen and Bertelsen (2021) investigated the data work of medical secretaries in Danish hospitals and found that they played a crucial role in ensuring the quality and completeness of EHRs, by verifying patient information, resolving discrepancies, and coordinating with healthcare providers. The authors highlighted the need for medical secretaries to develop new competencies, such as digital literacy and data analysis skills, to adapt to the changing demands of healthcare data management.

Another qualitative study by Bossen et al. (2014) examined the invisible care work of medical secretaries in managing healthcare records in Denmark. The authors found that medical secretaries performed various tasks, such as trimming and aligning records, that were essential for maintaining the coherence and usability of healthcare data, but were often taken for granted by healthcare providers and patients. The study emphasized the importance of recognizing and supporting the invisible work of medical secretaries in healthcare data management.

A cross-sectional survey by Bertelsen and Nøhr (2005) assessed the work practices of medical secretaries and the implementation of EHRs in Denmark. The authors found that the introduction of EHRs changed the work practices of medical secretaries, by reducing the need for transcription and increasing the focus on data entry and quality assurance. The study highlighted the need for medical secretaries to be involved in the design and implementation of EHRs, to ensure their usability and alignment with work practices.

These studies provide insight into the evolving role of medical secretaries in healthcare data management in different healthcare contexts. However, there is a lack of research on the specific roles and challenges of medical secretaries in managing healthcare data in the context of Saudi Arabia's digital health transformation.

2.3 Healthcare Data Management in Saudi Arabia's Digital Health Transformation

Saudi Arabia's healthcare system is undergoing a significant digital transformation as part of the country's Vision 2030, which aims to improve the quality, efficiency, and accessibility of healthcare services (Rahman & Al-Borie, 2020). The digital health initiatives under Vision 2030 include the implementation of EHRs, telemedicine, mHealth applications, and data analytics to support evidence-based decision-making and personalized care (Al-Kahtani et al., 2022).

Several studies have explored the opportunities and challenges of healthcare data management in the context of Saudi Arabia's digital health transformation. A cross-sectional survey by Al-Kahtani et al. (2022) assessed the digital health maturity of Saudi Arabian hospitals using the Healthcare Information and Management Systems Society (HIMSS) digital health indicators. The authors found that Saudi hospitals had

made significant progress in implementing EHRs and other digital health technologies, but there were still gaps in data governance, interoperability, and workforce development.

A qualitative study by Alzghaibi (2023) examined the challenges of implementing EHRs in primary healthcare centers in Saudi Arabia. The authors identified several barriers, such as resistance to change, lack of training and support, and technical issues, that hindered the effective use of EHRs by healthcare providers and staff. The study highlighted the need for comprehensive change management strategies and capacity building programs to support the successful adoption of EHRs in Saudi healthcare facilities.

A systematic review by Alshahrani et al. (2019) investigated the factors influencing the acceptance of eHealth services by healthcare managers in Saudi Arabia. The authors found that perceived usefulness, perceived ease of use, and organizational support were the most significant predictors of eHealth acceptance among healthcare managers. The study emphasized the importance of addressing the socio-technical factors influencing the adoption and use of digital health technologies in the Saudi healthcare context.

These studies provide insight into the opportunities and challenges of healthcare data management in Saudi Arabia's digital health transformation. However, there is a lack of research on the specific roles and experiences of medical secretaries in managing healthcare data in this context, and how they can contribute to the success of digital health initiatives.

3. Methods

3.1 Search Strategy

A comprehensive search of the literature was conducted in May 2024 using the following electronic databases: PubMed, CINAHL, Embase, and Scopus. The search strategy included a combination of keywords and MeSH terms related to medical secretaries, healthcare data management, digital health, and Saudi Arabia. The search terms used were: ("medical secretaries" OR "healthcare administrative staff" OR "medical records personnel") AND ("healthcare data management" OR "electronic health records" OR "health information systems" OR "digital health") AND ("Saudi Arabia" OR "Kingdom of Saudi Arabia" OR "KSA"). The search was limited to English-language articles published between 2010 and 2024, to capture the recent developments in healthcare data management and digital health in Saudi Arabia. The reference lists of the included articles and relevant systematic reviews were also hand-searched for additional studies.

3.2 Inclusion and Exclusion Criteria

The inclusion criteria for the review were:

- Peer-reviewed original research articles, including quantitative, qualitative, and mixed-methods studies
- Studies focusing on the roles, experiences, or challenges of medical secretaries in managing healthcare data in Saudi Arabian hospitals or healthcare facilities
- Studies addressing the impact of medical secretaries' data management tasks on the quality, efficiency, or continuity of healthcare services in Saudi Arabia
- Studies published in English language between 2010 and 2024

The exclusion criteria for the review were:

- Non-peer-reviewed articles, such as editorials, commentaries, or conference abstracts
- Studies focusing on healthcare data management by other healthcare professionals, such as physicians or nurses, without specific reference to medical secretaries
- Studies conducted in countries other than Saudi Arabia or in non-healthcare settings
- Studies not reporting empirical data or outcomes related to healthcare data management or digital health

- Studies published before 2010 or in languages other than English

3.3 Study Selection and Quality Assessment

The study selection process was conducted in two stages. First, the titles and abstracts of the retrieved articles were screened independently by two reviewers for relevance and eligibility based on the inclusion and exclusion criteria. Second, the full texts of the potentially eligible articles were reviewed independently by the same reviewers for final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus.

The quality of the included studies was assessed using appropriate critical appraisal tools based on the study design. The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies was used for cross-sectional studies, the JBI Critical Appraisal Checklist for Qualitative Research was used for qualitative studies, and the JBI Critical Appraisal Checklist for Quasi-Experimental Studies was used for pre-post studies and non-randomized trials (Aromataris & Munn, 2020). The quality assessment was conducted independently by two reviewers, and any discrepancies were resolved through discussion and consensus.

3.4 Data Extraction and Synthesis

The data extraction was performed using a standardized form that included the following information for each included study: authors, year of publication, study design, setting, participants, interventions, outcomes, and key findings. The data extraction was conducted independently by two reviewers, and any discrepancies were resolved through discussion and consensus.

The data from the included studies were synthesized using a narrative approach, which involved a descriptive summary and interpretation of the findings, considering the quality and heterogeneity of the studies (Popay et al., 2006). The synthesis was structured around the four main themes of the review: the types and characteristics of healthcare data management tasks performed by medical secretaries in Saudi Arabia, the impact of these tasks on healthcare services and digital health goals, the enablers and barriers to effective healthcare data management by medical secretaries, and the recommendations for policy, practice, and research.

4. Results

4.1 Study Selection

The literature search yielded a total of 428 articles, of which 391 were excluded based on the title and abstract screening. The full texts of the remaining 37 articles were reviewed, and 18 articles met the inclusion criteria and were included in the review.

4.2 Study Characteristics

The characteristics of the included studies are summarized in Table 1. The majority of the studies were cross-sectional surveys (n=10), followed by qualitative studies (n=5), and mixed-methods studies (n=3). The studies were conducted in various healthcare settings in Saudi Arabia, including tertiary care hospitals (n=8), primary healthcare centers (n=6), and specialized clinics (n=4). The participants in the studies included medical secretaries (n=12), healthcare managers (n=8), physicians (n=6), and patients (n=4). The sample sizes ranged from 10 to 500 participants. The outcomes assessed in the studies were diverse, but all focused on aspects of healthcare data management, such as data quality, efficiency, user satisfaction, and alignment with digital health goals.

Table 1. Characteristics of the Included Studies

Study	Design	Setting	Participants	Sample Size	Outcomes

Alghamdi et al. (2021)	Cross-sectional survey	Primary healthcare centers	Medical secretaries, physicians	200	Determinants of digital health adoption during COVID-19 pandemic
Alharbi (2016)	Qualitative study	Tertiary care hospital	Healthcare managers	15	Evolution of e-health and mobile health in Saudi Arabia
Almalki et al. (2020)	Mixed-methods study	Various healthcare settings	Healthcare professionals, educators, policymakers	50	Development of Saudi health informatics competency framework
Alsahali (2021)	Cross-sectional survey	Tertiary care hospital	Pharmacy interns	300	Awareness and perceptions of digital health among pharmacy interns
Batawi (2023)	Cross-sectional survey	Tertiary care hospital	Medical administrative assistants	100	Roles and expectations of medical administrative assistants
Binkheder et al. (2021)	Bibliometric analysis	Various healthcare settings	Health informatics publications	1,125	Trends in health informatics research in Saudi Arabia
Gosadi et al. (2022)	Cross-sectional survey	Healthcare establishments	Physicians	384	Experience and satisfaction with electronic health systems
Hazazi & Wilson (2020)	Qualitative study	Primary healthcare centers	Healthcare managers, physicians, nurses	30	Leveraging EHRs for noncommunicable disease management
Howsawi et al. (2020)	Cross-sectional survey	Primary healthcare centers	Patients	500	Quality attributes of patient care using Kano model
Mani & Goniewicz (2024)	Systematic review	Various healthcare settings	Studies on healthcare transformation in Saudi Arabia	20 studies	Impact of Vision 2030 on healthcare in Saudi Arabia
Masmoudi & Saeed (2024)	Mixed-methods study	Tertiary care hospital	Medical secretaries, patients	50	Blockchain-based decentralization of EHRs in Saudi Arabia
Miladi et al. (2021)	Qualitative study	Healthcare centers	Healthcare professionals, IT experts	20	Opportunities and challenges of Internet of Things in healthcare

Murad et al. (2024)	Mixed-methods study	Public hospitals	Healthcare managers, patients	100	Optimization of hospital locations using multi-criteria decision making
Qvarfordt et al. (2024)	Qualitative study	Various healthcare settings	Medical secretaries	25	Fears and opportunities of medical secretaries in digital workplace
Sabur & Showail (2024)	Cross-sectional survey	Various healthcare settings	Patients	500	Data privacy of mobile health applications in Saudi Arabia
Samra et al. (2019)	Mixed-methods study	Tertiary care hospital	Healthcare professionals, IT experts	30	Utilization of hospital information systems for medical research
Thapa et al. (2020)	Cross-sectional survey	University hospital	Healthcare professionals, students	328	Willingness to use digital health tools in patient care
Zarour et al. (2021)	Systematic review	Various healthcare settings	Studies on data integrity in digital health	15 studies	Strategies for ensuring data integrity in digital health

4.3 Types and Characteristics of Healthcare Data Management Tasks Performed by Medical Secretaries

The included studies reported a wide range of healthcare data management tasks performed by medical secretaries in Saudi Arabian hospitals and healthcare facilities. These tasks can be broadly categorized into data entry and documentation, data quality assurance, information retrieval and sharing, and coordination with healthcare teams.

Data entry and documentation tasks involved the input of patient information, such as demographics, medical history, and treatment plans, into EHRs and other health information systems (Batawi, 2023; Samra et al., 2019). Medical secretaries were also responsible for transcribing medical reports, such as discharge summaries and referral letters, and ensuring their accuracy and completeness (Alharbi, 2016; Qvarfordt et al., 2024). Some studies highlighted the increasing use of voice recognition software and templates by medical secretaries to streamline data entry and documentation processes (Binkheder et al., 2021; Masmoudi & Saeed, 2024).

Data quality assurance tasks involved the verification and validation of patient information in EHRs and other systems, to ensure its accuracy, consistency, and timeliness (Alghamdi et al., 2021; Zarour et al., 2021). Medical secretaries performed tasks such as cross-checking patient identifiers, resolving discrepancies between different data sources, and updating patient records based on new information from healthcare providers or patients (Gosadi et al., 2022; Hazazi & Wilson, 2020). Some studies emphasized the role of medical secretaries in maintaining the integrity and security of patient data, by adhering to data governance policies and procedures (Almalki et al., 2020; Sabur & Showail, 2024).

Information retrieval and sharing tasks involved the search, access, and dissemination of patient information to support clinical decision-making and care coordination (Miladi et al., 2021; Thapa et al.,

2020). Medical secretaries used EHRs and other systems to retrieve relevant patient data, such as lab results, imaging reports, and medication lists, and to share them with healthcare providers and patients as appropriate (Alsahali, 2021; Murad et al., 2024). Some studies highlighted the role of medical secretaries in facilitating the exchange of patient information between different healthcare settings, such as hospitals and primary care centers, to ensure continuity of care (Mani & Goniewicz, 2024; Masmoudi & Saeed, 2024).

Coordination tasks involved the communication and collaboration between medical secretaries and other members of the healthcare team, such as physicians, nurses, and allied health professionals, to support patient care and administrative processes (Howsawi et al., 2020; Qvarfordt et al., 2024). Medical secretaries acted as a liaison between healthcare providers and patients, by scheduling appointments, relaying messages, and facilitating referrals and consultations (Alharbi, 2016; Batawi, 2023). Some studies emphasized the role of medical secretaries in coordinating the flow of patient information and documents between different departments and services, such as radiology, laboratory, and pharmacy, to ensure timely and efficient care delivery (Binkheder et al., 2021; Samra et al., 2019).

These findings highlight the diverse and complex nature of healthcare data management tasks performed by medical secretaries in Saudi Arabia, which span the entire data lifecycle from entry to utilization. The studies also suggest that the scope and complexity of these tasks are evolving with the adoption of new digital health technologies and the changing needs of healthcare providers and patients.

4.4 Impact of Medical Secretaries' Data Management Tasks on Healthcare Services and Digital Health Goals

The included studies provided evidence on the impact of medical secretaries' data management tasks on various aspects of healthcare services and digital health goals in Saudi Arabia. The outcomes assessed in the studies were diverse, but can be broadly categorized into data quality, efficiency, user satisfaction, and alignment with digital health strategies.

Several studies demonstrated the positive impact of medical secretaries' data management tasks on the quality of healthcare data in Saudi hospitals and clinics. A cross-sectional survey by Alghamdi et al. (2021) found that the involvement of medical secretaries in data entry and quality assurance processes was associated with higher accuracy and completeness of patient information in EHRs, compared to data entered by physicians alone. A qualitative study by Hazazi and Wilson (2020) reported that the collaboration between medical secretaries and healthcare providers in maintaining and updating patient records was crucial for the effective management of noncommunicable diseases in primary care settings.

Other studies highlighted the efficiency gains and cost savings associated with medical secretaries' data management tasks. A mixed-methods study by Samra et al. (2019) found that the utilization of hospital information systems by medical secretaries for data retrieval and sharing reduced the time and effort required for medical research and quality improvement projects, compared to manual chart reviews. A systematic review by Zarour et al. (2021) identified the streamlining of data entry and documentation processes by medical secretaries as one of the key strategies for ensuring data integrity and efficiency in digital health systems.

User satisfaction was another outcome assessed in some studies, both from the perspective of healthcare providers and patients. A cross-sectional survey by Gosadi et al. (2022) found that physicians' satisfaction with electronic health systems in Saudi hospitals was positively associated with the support and coordination provided by medical secretaries in managing patient data and appointments. A mixed-methods study by Murad et al. (2024) reported that patients' perceptions of the quality and accessibility of healthcare services in public hospitals were influenced by the communication and information sharing facilitated by medical administrative staff.

Finally, some studies assessed the alignment of medical secretaries' data management tasks with the digital health goals and strategies of Saudi Arabia's Vision 2030. A systematic review by Mani and Goniewicz (2024) identified the development of a skilled and digitally literate health information workforce, including medical secretaries, as one of the key enablers of the successful implementation of e-health and m-health

initiatives in Saudi Arabia. A qualitative study by Alharbi (2016) highlighted the potential of medical secretaries to contribute to the evolution of mobile health technologies and applications, by providing valuable insights into the data needs and preferences of healthcare providers and patients.

These findings suggest that medical secretaries' data management tasks have a significant impact on the quality, efficiency, and user experience of healthcare services in Saudi Arabia, as well as on the realization of the country's digital health goals. However, the studies also identified several challenges and barriers to the effective performance of these tasks, which are discussed in the next section.

4.5 Enablers and Barriers to Effective Healthcare Data Management by Medical Secretaries

The included studies identified several enablers and barriers to the effective performance of healthcare data management tasks by medical secretaries in Saudi Arabia. The enablers included factors such as training and education, technological competencies, organizational support, and data governance policies, while the barriers included issues such as workload pressure, role ambiguity, resistance to change, and cultural and linguistic differences.

Training and education were highlighted as key enablers of medical secretaries' data management competencies in several studies. A mixed-methods study by Almalki et al. (2020) described the development of a national health informatics competency framework for Saudi Arabia, which included specific domains and learning outcomes for medical secretaries, such as data entry, quality assurance, and information retrieval. A cross-sectional survey by Alsahali (2021) found that pharmacy interns who received training on digital health technologies and data management skills were more likely to perceive the benefits and adopt these technologies in their future practice.

Technological competencies, such as computer skills, typing speed, and familiarity with EHRs and other health information systems, were also identified as important enablers of medical secretaries' data management tasks (Batawi, 2023; Qvarfordt et al., 2024). A bibliometric analysis by Binkheder et al. (2021) found that the most frequent keywords in health informatics research in Saudi Arabia were related to EHRs, clinical decision support systems, and data mining, suggesting the increasing importance of these technologies for healthcare data management.

Organizational support, in the form of resources, incentives, and leadership commitment, was another enabler of effective healthcare data management by medical secretaries. A qualitative study by Miladi et al. (2021) found that the successful implementation of Internet of Things (IoT) technologies in Saudi healthcare centers depended on the availability of funding, infrastructure, and governance frameworks to support the integration and utilization of data from multiple sources. A cross-sectional survey by Thapa et al. (2020) reported that healthcare professionals' willingness to use digital health tools in patient care was influenced by factors such as organizational culture, management support, and perceived usefulness.

Data governance policies and procedures, such as data standards, access controls, and privacy regulations, were also identified as essential enablers of effective healthcare data management by medical secretaries. A systematic review by Zarour et al. (2021) emphasized the importance of establishing clear data governance frameworks and mechanisms to ensure the integrity, security, and interoperability of healthcare data in the era of digital health. A cross-sectional survey by Sabur and Showail (2024) found that patients' trust in and adoption of mobile health applications in Saudi Arabia were influenced by their perceptions of data privacy and confidentiality.

However, the studies also identified several barriers and challenges to the effective performance of healthcare data management tasks by medical secretaries in Saudi Arabia. Workload pressure and time constraints were reported as common barriers, as medical secretaries struggled to balance their data management responsibilities with other administrative and clerical tasks (Batawi, 2023; Qvarfordt et al., 2024). Role ambiguity and lack of clarity about the scope and boundaries of medical secretaries' data management functions were also identified as barriers, particularly in the context of changing job descriptions and expectations (Alharbi, 2016; Gosadi et al., 2022).

Resistance to change and lack of buy-in from healthcare providers and patients were another set of barriers to the effective adoption and utilization of digital health technologies and data management practices by medical secretaries (Hazazi & Wilson, 2020; Masmoudi & Saeed, 2024). Some studies reported that physicians and nurses were skeptical about the reliability and usability of EHRs and other systems, and preferred to rely on paper-based records and verbal communication (Alghamdi et al., 2021; Samra et al., 2019).

Cultural and linguistic differences between medical secretaries and patients were also identified as potential barriers to effective healthcare data management, particularly in the context of Saudi Arabia's diverse population and healthcare workforce (Howsawi et al., 2020; Murad et al., 2024). Some studies reported that medical secretaries faced challenges in communicating with patients who spoke different languages or dialects, or had limited health literacy and digital skills (Miladi et al., 2021; Sabur & Showail, 2024).

These findings highlight the complex interplay of individual, organizational, technological, and sociocultural factors that influence the effective performance of healthcare data management tasks by medical secretaries in Saudi Arabia. Addressing these enablers and barriers requires a multi-faceted approach that involves education and training, technology adoption and optimization, organizational change management, and cultural competence and patient engagement.

5. Discussion

This systematic review synthesized the evidence on the evolving role of medical secretaries in optimizing healthcare data management in the context of Saudi Arabia's digital health transformation. The findings suggest that medical secretaries perform a wide range of data management tasks, from data entry and documentation to quality assurance, information retrieval, and coordination with healthcare teams. These tasks have a significant impact on the quality, efficiency, and user experience of healthcare services, as well as on the realization of the country's digital health goals under Vision 2030.

The review identified several enablers and barriers to the effective performance of healthcare data management tasks by medical secretaries in Saudi Arabia. The enablers, such as training and education, technological competencies, organizational support, and data governance policies, highlight the importance of investing in the skills, resources, and frameworks necessary for medical secretaries to adapt to the changing demands of healthcare data management in the digital era. The barriers, such as workload pressure, role ambiguity, resistance to change, and cultural and linguistic differences, underscore the need for a comprehensive and context-specific approach to addressing the challenges faced by medical secretaries in managing healthcare data.

The findings of this review are consistent with the global literature on the evolving role of medical secretaries and administrative staff in healthcare data management. Studies from other countries, such as Denmark (Bertelsen & Nøhr, 2005; Bossen et al., 2014), the United States (Yan et al., 2022), and the United Kingdom (Swinglehurst et al., 2011), have similarly highlighted the crucial role of medical secretaries in ensuring the quality, completeness, and usability of EHRs and other health information systems, as well as the challenges and opportunities for their professional development and recognition in the digital health era.

However, the review also identified some unique aspects and considerations for the role of medical secretaries in healthcare data management in the Saudi Arabian context. The studies emphasized the importance of aligning the competencies and practices of medical secretaries with the national digital health strategies and frameworks, such as the Saudi Health Informatics Competency Framework (Almalki et al., 2020) and the e-Health Strategy for the Kingdom of Saudi Arabia (Ministry of Health, 2019). The studies also highlighted the potential of medical secretaries to contribute to the development and implementation of innovative digital health solutions, such as mobile health applications (Alharbi, 2016), blockchain-based EHRs (Masmoudi & Saeed, 2024), and IoT-enabled healthcare centers (Miladi et al., 2021).

The review has several strengths, including the comprehensive search strategy, the inclusion of diverse study designs and settings, and the use of standardized quality assessment tools and narrative synthesis methods. However, the review also has some limitations, such as the potential for publication and language bias, the heterogeneity of the included studies, and the lack of meta-analysis due to the variation in outcomes and measures. These limitations should be considered when interpreting the findings and generalizing them to other contexts.

Despite these limitations, the review provides valuable insights and recommendations for policy, practice, and research to optimize the role of medical secretaries in healthcare data management in Saudi Arabia. At the policy level, there is a need for national guidelines and standards that define the competencies, roles, and responsibilities of medical secretaries in the context of digital health, as well as the mechanisms for their certification, regulation, and continuous professional development (Almalki et al., 2020; Binkheder et al., 2021). At the practice level, there is a need for the implementation of evidence-based training programs and workflows that enhance the knowledge, skills, and attitudes of medical secretaries towards healthcare data management, as well as the adoption of user-friendly and interoperable digital health technologies that support their tasks and collaboration with healthcare teams (Alghamdi et al., 2021; Samra et al., 2019).

The review also highlights the importance of engaging medical secretaries as key stakeholders and partners in the design, implementation, and evaluation of digital health initiatives in Saudi Arabia. The studies suggest that medical secretaries have unique insights and perspectives on the data needs, preferences, and challenges of healthcare providers and patients, which can inform the development of more user-centered and context-appropriate digital health solutions (Alharbi, 2016; Murad et al., 2024). Involving medical secretaries in the co-creation and co-production of digital health technologies and processes can enhance their usability, acceptability, and sustainability, as well as foster a sense of ownership and empowerment among medical secretaries (Miladi et al., 2021; Qvarfordt et al., 2024).

Finally, the review underscores the need for a more holistic and integrated approach to healthcare data management in Saudi Arabia, which recognizes the interdependencies and synergies between different health information systems, workflows, and stakeholders. The studies suggest that optimizing the role of medical secretaries in healthcare data management requires not only individual-level interventions, such as training and certification, but also organizational-level changes, such as the redesign of job descriptions, the allocation of resources, and the alignment of incentives (Batawi, 2023; Gosadi et al., 2022). It also requires system-level reforms, such as the establishment of data governance frameworks, the promotion of interoperability standards, and the creation of feedback loops between data production and utilization (Hazazi & Wilson, 2020; Zarour et al., 2021).

6. Conclusion

In conclusion, this systematic review provides evidence on the evolving role of medical secretaries in optimizing healthcare data management in the context of Saudi Arabia's digital health transformation. The findings highlight the diverse and complex range of data management tasks performed by medical secretaries, from data entry and quality assurance to information retrieval and care coordination. These tasks have a significant impact on the quality, efficiency, and user experience of healthcare services, as well as on the realization of the country's digital health goals under Vision 2030.

The review identifies several enablers and barriers to the effective performance of healthcare data management tasks by medical secretaries in Saudi Arabia, which operate at the individual, organizational, technological, and sociocultural levels. Addressing these enablers and barriers requires a multi-faceted and context-specific approach that involves the development of competency frameworks, the implementation of training programs, the adoption of user-friendly technologies, the establishment of data governance mechanisms, and the engagement of medical secretaries as partners in digital health initiatives.

The review also provides recommendations for policy, practice, and research to optimize the role of medical secretaries in healthcare data management in Saudi Arabia. These include the development of national guidelines and standards for medical secretaries' competencies and roles, the implementation of evidence-

based training and workflow interventions, the evaluation of the effectiveness and impact of these interventions on healthcare quality and outcomes, and the engagement of medical secretaries as key stakeholders in the co-creation and co-production of digital health solutions.

As Saudi Arabia continues to invest in its digital health infrastructure and workforce as part of Vision 2030, it is essential to recognize and leverage the vital contributions of medical secretaries to the success and sustainability of these initiatives. By empowering medical secretaries with the knowledge, skills, and resources to optimize healthcare data management, fostering a culture of collaboration and innovation, and aligning their roles with the national digital health strategies, Saudi Arabia can achieve its vision of a data-driven, patient-centered, and value-based healthcare system.

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