Electronic Health Records System's Routinization:

Exploring healthcare workers' experiences in a Chinese Public Hospital

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ABSTRACT (MAX. 200 WORDS):
This study investigates the routinization of Electronic Health Records (EHR) systems in a Chinese hospital setting, focusing on Yangzhou University Hospital. Utilizing Adaptive Structuration Theory (AST), the research explores the complex interplay between technology, human agency, and organizational structures in the context of EHR implementation. The study reveals challenges in interoperability due to the absence of a national EHR standard in China, resistance from hospital staff to new system formats, and the need for effective training and transition strategies. The findings highlight the necessity of a national standard for EHR systems to ensure interoperability and the importance of addressing user concerns in the routinization process. This research contributes to the understanding of EHR system implementation in China, providing insights for policymakers, healthcare administrators, and system developers.

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1 Introduction

The introduction provides an overview of the research field, highlighting the context and significance of the subject matter. It introduces the problem area that serves as a driving force behind the research. Following the background and problem area, the research question, which forms the foundation of the study, is presented along with the study's objectives and its boundaries.

1.1 Background

The worldwide deployment of Electronic Health Records (EHR) in healthcare systems is widely recognized as a significant step towards enhancing the efficiency and quality of medical services (Ankem et al., 2017). Research highlights the crucial role of EHR acceptance and utilization by medical professionals, especially physicians, in the successful implementation of these systems (Hsieh, 2015; Or et al., 2018)In China, the integration of EHR systems into hospital environments has rapidly increased, driven largely by the government's strong push towards health digitalization in 2019 (Liang et al., 2021; National Health Commission of the People's Republic of China, 2022). However, there is a notable gap in empirical research on the adoption and institutionalization of EHR systems by Chinese healthcare practitioners (Liang et al., 2021).

This research gap presents an opportunity to explore the complex dynamics that underlie the adoption, integration, and eventual routine use of EHR systems within the unique context of Chinese hospitals. Utilizing Adaptive Structuration Theory (AST) as a framework, this study aims to shed light on the intricate interaction between technology and human action in the process of routinization, exploring how evolving practices influence the trajectory of EHR implementation in Chinese healthcare institutions. Routinization refers to the transition of new practices, systems, or technologies from being disruptive to becoming established routines within a specific context(Biagi & Sebastian, 2020). This transition is characterized by a nuanced interplay of human agency, technological progress, and contextual factors (Lazaric, 2012). The path to routinization is marked by both challenges and opportunities, requiring strategic approaches to navigate these obstacles. In healthcare systems, the routinization of EHR systems is particularly crucial as healthcare professionals adapt to new methods of documenting, accessing, and sharing patient information, thereby shaping the effectiveness and efficiency of healthcare delivery.

Routinization plays a significant role in the implementation of EHR within healthcare systems. It signifies the shift of new practices, like EHR systems, from initial disruption to becoming integral parts of organizational routines (Adam et al., 2008; Boonstra et al., 2014). This shift is pivotal for EHR implementation, reflecting the transition from irregular and trial usage to the consistent integration of EHR into the daily workflows of healthcare professionals. As EHR systems evolve from novel ideas to standard routines, their acceptance and integration become deeply embedded in the operational dynamics of healthcare environments.

This transformative journey is steered by the intricate interaction of human agency, technological advancements, and contextual complexities. Addressing the challenges and seizing the opportunities encountered along this path requires strategic approaches (Li et al., 2021). In the context of EHR implementation, routinization facilitates the alignment of technology with established practices, fostering a more intuitive and user-friendly adoption of EHR systems. This alignment streamlines the incorporation of EHR into existing workflows, mitigating resistance to change, and enhancing the potential for improved healthcare service delivery, efficiency, and patient outcomes. Ultimately, the process of routinization is a key factor in the successful integration and lasting impact of EHR systems within healthcare organizations.

This exploration into uncharted territory aims to provide insights and strategies for enhancing the adoption and effectiveness of EHR systems within China's evolving healthcare landscape.

1.2 Global Perspectives on EHR Routinization: Diverse Models and Practices

Exploring healthcare systems globally unveils a rich tapestry of Electronic Health Record (EHR) routinization models, showcasing diverse methodologies in technology integration and patient data management. This exploration leads us through unique paradigms adopted by various nations, each shaped by its distinct priorities, regulatory frameworks, and healthcare philosophies. In this analysis, we focus on the EHR routinization models prevalent in four distinct regions: the United States, Hong Kong, the United Kingdom, and Mainland China. These models include the U.S. Free Market model, Hong Kong's Single System approach, the U.K.'s National Standard & API strategy, and Mainland China's blend of Regional Standards with a free market approach. Each model not only mirrors the specific complexities of its healthcare environment but also contributes to the global conversation on achieving efficient, secure, and patient-focused health data management through the sustained integration and normalization of EHR systems in daily healthcare practices.

1.2.1   EHR system Routinization in the United States

In the United States healthcare landscape, the routinization of Electronic Health Record (EHR) systems is significantly influenced by the requirement for certified electronic health record technology (CEHRT), adhering to a structured data format. This framework is crucial in facilitating the effective acquisition and exchange of patient data, thereby streamlining healthcare practices and supporting informed decision-making. The structured data approach enables healthcare providers to seamlessly retrieve and transmit patient-centric information, integrating EHR systems into daily medical practices to enhance patient care (Holmgren & Apathy, 2023).

The Centers for Medicare & Medicaid Services (CMS) and the Office of the National Coordinator for Health Information Technology (ONC) jointly oversee regulatory standards in this area. Their collaboration establishes criteria and benchmarks for structured data, essential for EHR systems to be integrated effectively into the Medicare Promoting Interoperability Program(Health and Human Services Department, 2023).

In hospital settings, Electronic Medical Record (EMR) and EHR software solutions, including systems like Epic, Cerner, Meditech, CPSI, Allscripts, and McKesson, have become integral to healthcare delivery. These systems offer functionalities such as computerized provider order entry, decision-support mechanisms to reduce drug interactions, secure electronic communication with patients, and tools for disease management and health information access (Kanakubo & Kharrazi, 2019).

Ultimately, the interaction between regulatory requirements, standardized data structures, and advanced EHR systems highlights the United States' dedication to enhancing healthcare quality and efficiency. This is achieved through the deep integration of technology into healthcare processes and the strategic use of data, reflecting a commitment to the ongoing routinization and optimization of EHR systems in healthcare delivery.

1.2.2   Routinization of Clinical Management Systems in Hong Kong's Healthcare

In Hong Kong's healthcare landscape, the government has played a pivotal role in the routinization of clinical management systems (CMS) to enhance healthcare provider operations in clinical record management and workflow facilitation. These systems, provided at no cost, are integral in streamlining clinical processes(Cheung, 2016).

CMS On-ramp, one of these systems, offers a comprehensive solution tailored for the local private clinic environment. It facilitates a range of administrative and clinical tasks, including patient registration, appointment scheduling, clinical documentation, and prescription management. This system not only aids in routine clinical operations but also enables healthcare providers to securely share patient data under the Electronic Health Record Sharing System (eHealth), respecting patient consent(Høstgaard et al., 2017).

The second system, EC Connect, catering specifically to Chinese medicine (CM) clinics, shares the foundational principles of CMS On-ramp. This system's development aligns with the strategic expansion of eHealth, focusing on integrating CM-related information into the broader healthcare framework. This initiative underscores Hong Kong's commitment to incorporating diverse medical practices into a unified digital health strategy, promoting an inclusive healthcare environment(Cheung, 2016).

1.2.3   EHR System Routinization in the United Kingdom's NHS

The United Kingdom's National Health Service (NHS) has embarked on a long-term journey to routinize Electronic Health Record (EHR) systems across various medical settings, including hospitals and General Practitioners (GPs). This effort is part of a broader strategy to establish a comprehensive, accessible EHR system nationwide(Chada, 2022).

A key aspect of this initiative is the harmonization and integration of patient records, as outlined in the "Personalised Health and Care 2020" plan. The UK government aims to implement EHR systems in all healthcare facilities by 2025, complemented by a workforce augmentation strategy to address the sector's needs by 2030. This strategy includes developing human resources through graduate programs, apprenticeships, and recruitment to support the digital transformations (Schleyer, 2022).

The NHS App, a central component of this digital health strategy, is set to expand its functionalities, including patient registration with GP surgeries via the app. This enhancement, operational from March 2023, exemplifies the NHS's commitment to making healthcare services more accessible through digital means (Macnair et al., 2021).

NHS Digital plays a crucial role in this transformation, offering a range of Application Programming Interfaces (APIs) and establishing API standards to facilitate interoperability and data integration. This effort, particularly in collaboration with Fast Healthcare Interoperability Resources (FHIR), aims to standardize EHR-related APIs, ensuring seamless data exchange across the healthcare system (Schleyer, 2022).

1.2.4   Routinization of Healthcare Information Technology in Mainland China

The evolution of Healthcare Information Technology (HIT) in Mainland China has undergone several distinct phases, each marking a significant step in the routinization of digital healthcare systems.

1.2.4.1   *Early Development in the 1970s – 1990s*
The journey began in the late 1970s, aligning with China's economic reforms. This era saw the introduction of minicomputers into select medical institutions, a move that laid the groundwork for the future integration of technology in healthcare. The subsequent proliferation of affordable microcomputers in the Chinese market further facilitated this integration, with domestic research and development focusing on adapting these technologies for medical use (ed. Tang, 2023)

During The mid-1990s marked a pivotal period where the Institute of Hospital Management under the Ministry of Health initiated collaborative system development projects. This era witnessed the expansion of HIT, driven by the growing need for digitalization in hospitals and the increasing complexity of healthcare systems. The focus during this period gradually shifted towards clinical applications, with the development of Clinical Information Systems, Laboratory Information Systems (LIS), Picture Archiving and Communication Systems (PACS), and Rational Drug Use Monitoring systems. These developments were further bolstered by the integration of medical insurance programs, facilitating seamless data exchange between healthcare institutions and insurance systems(Liang et al., 2021; Xiang & Li, 2014).

1.2.4.2   *New Era of Healthcare Reform 1990s-2009*
The issuance of the "Opinions on Deepening the Reform of the Healthcare and Pharmaceutical Systems" by the State Council in 2009 marked the beginning of a new era in healthcare reform. This period saw the implementation of the "2011-2015 Health Digitalization Development Plan," focusing on the standardization and functionality of Electronic Medical Records (EMR) and a comprehensive drive towards population health digitalization. The "46312" framework initiated in 2013 aimed to achieve seamless information sharing across healthcare institutions(Xiang & Li, 2014).

1.2.4.3   *Focus on Interoperability and Data Integration Post-2015*
From 2015 onwards, the emphasis in China's HIT development has been on data integration and interoperability. The "National Plan for Medical and Health Services System (2015-2020)" set ambitious goals for comprehensive coverage of population health records and EMRs. Efforts were directed towards building interconnected health information platforms,

enhancing public health services, and leveraging advances in mobile internet and telemedicine. The widespread adoption of resident health cards facilitated seamless access to medical services(Hipgrave & Mu, 2019).

1.2.4.4 *Current State and Future Directions*
In 2018, the "National Hospital Digitalization Construction Standards and Specifications (Trial)" provided a framework for ongoing digitalization efforts. Despite these advancements, a national standard for EHR has yet to be established, with regional and industry standards currently influencing EHR products at different levels. This ongoing development reflects China's commitment to continually evolving its HIT landscape, aiming for a more integrated, efficient, and patient-centered healthcare system(Liang et al., 2021).

1.3 Problem Area

Understanding the user perspective of EHR systems as tools to enhance healthcare delivery has become a subject of investigation(Upadhyay & Hu, 2022). It is essential to prioritise user needs and ensure user-centred development to avoid non-intuitive technology that hinders the intended benefits of improved efficiency and quality(Carayon et al., 2014; Liang et al., 2021). Addressing issues such as reducing administrative work and minimising data entry and retrieval duplication are crucial objectives of eHealth systems(Ljubicic et al., 2020; Wang et al., 2018). Previous research has identified a relationship between poor system usability, increased error rates, low user satisfaction, and compromised patient safety(Howe et al., 2018; Kaipio et al., 2017; Vainiomäki et al., 2017).

The involvement of end-users in eHealth development has been acknowledged as a significant factor influencing the success or failure of new software implementations (Høstgaard et al., 2017). Despite its importance, end-user involvement is rarely practised, underscoring the necessity to investigate end-user participation in eHealth development and explore the reasons behind implementation outcomes (Ankem et al., 2017; Ribaut et al., 2020; Vandelanotte et al., 2016).

While studies evaluating EHR systems have been conducted, additional research, particularly qualitative studies, is needed to gain deeper insights into healthcare systems (Høstgaard et al., 2017). The master's thesis examines the routinization of an Electronic Health Records (EHR) system in a Chinese public hospital from the healthcare workers perspective. Consequently, the aim is to provide insights that can improve users' interaction and use of the EHR system.

Unlike previous studies that predominantly employed quantitative evaluation models, this study will solely adopt a qualitative research approach, encompassing the up-to-date EHR system in operation. The primary focus will be on the current paper-based system being replaced by a digital EHR system. The study aims to compare users' perceptions of the previous paper-based system with the replaced EHR system by eHealth developers.

1.4 Purpose

This study aims to explore the perceptions of healthcare professionals (doctors and nurses) regarding EHR systems. The study also seeks to establish a groundwork for future evaluations of EHR systems within China's digital transformation in healthcare.

1.5 Research Question

Considering the problem area, this thesis intends to address the following research question:

How do the healthcare workers in the Chinese hospital experience their interaction and use with the HER system and, thus its routinization?

1.6 Delimitations

Due to the scope of this study, it is delimited to not studying the stakeholder group patients. The study is also delimited to only investigate the institution Yangzhou University Hospital (as known as Yangzhou First People's Hospital or the Affiliated Hospital of Yangzhou Medical Academy). Lastly, findings regarding legal concerns will not be covered deeply since it opens the door to other exterior fields and problem areas. Nevertheless, these findings will be presented to increase transparency but not further investigated.

2 Theoretical Background

The theoretical background of this study is based on a comprehensive analysis of existing literature, leading to the development of a theoretical framework. Initially, the focus is on exploring the concept of Electronic Health Record (EHR). Subsequently, the Adaptive Structuration Theory, which forms the fundamental basis of this study, is introduced. This analysis serves as the foundation for the conceptual framework employed to assess EHR quality (refer to Section 2.4). Consequently, this framework guides the creation of the interview guide, which is presented in Section 3 and can be found in its entirety in Appendix 1-4.

2.1 Electronic Health Record Systems

Electronic Health Record (EHR) systems have been developed to facilitate the capture, storage, and management of patient health information in a digital format. Their utilisation across healthcare providers, hospitals, and clinics offers an encompassing overview of an individual's medical history, serving as a valuable resource for making informed decisions in patient care (Alsyouf & Ishak, 2018; Høstgaard et al., 2017; Li et al., 2021). This article aims to delve into the inner workings of EHRs, highlighting their essential components and the advantages they provide.

2.1.1   Core Functionalities and Structure

2.1.1.1   Data Capture and Storage
EHRs are meticulously designed to comprehensively capture and store diverse patient health information, encompassing medical diagnoses, prescribed medications, test results, allergies, immunizations, and pertinent health-related data. By employing a relational database model, EHRs efficiently manage and retrieve vast quantities of data (Pai et al., 2021).

2.1.1.2   Accessibility and Mobility
EHRs afford healthcare providers the ability to access patient information seamlessly, regardless of their physical location or care setting. This ubiquitous accessibility is facilitated through secure internet connections, permitting healthcare professionals to retrieve patient data promptly, anywhere and at any time (Liang et al., 2021).

2.1.2   Key Features of Electronic Health Record

Electronic Health Record (EHR) systems play a pivotal role in capturing, storing, and managing patient health information digitally. By providing a comprehensive view of a patient's medical history, EHRs equip healthcare providers, hospitals, and clinics with the necessary tools to make well-informed decisions regarding diagnosis, treatment, and management (Høstgaard et al., 2017; Shrivastava et al., 2019)The integration of Electronic Medical Records (EMRs), interoperability, decision support capabilities, patient portals, and billing and

coding functionalities are key features that enhance the utility of EHRs, improving patient care outcomes and enhancing administrative efficiency within healthcare settings.

2.1.2.1   Integration

EHRs integrate with Electronic Medical Records (EMRs), which serve as electronic versions of patients' medical records. While EMRs are commonly employed by individual healthcare providers, EHRs serve as platforms for aggregating information from multiple providers and care settings meticulously designed to comprehensively capture and store diverse patient health information, encompassing medical diagnoses, prescribed medications, test results, allergies, immunizations, and pertinent health-related data. By employing a relational database model, EHRs efficiently manage and retrieve vast quantities of data (Pai et al., 2021).

2.1.2.2   Interoperability

A defining characteristic of EHRs is their interoperability, enabling the exchange of information with other healthcare systems, including laboratory and imaging systems. This seamless integration allows healthcare providers to access and share patient data across diverse care settings, facilitating continuity of care (De Mello et al., 2022).

2.1.2.3   Decision Support

EHRs offer decision support tools to assist healthcare providers in making well-informed decisions regarding diagnosis, treatment, and management. These tools encompass alerts for potential drug interactions, reminders for preventive care, and clinical guidelines tailored to specific medical conditions (Wasylewicz & Scheepers-Hoeks, 2019).

2.1.2.4   Patient Portals

Incorporating patient portals, EHRs empower patients to access their personal health information and actively participate in their own care. Patient portals provide individuals with access to laboratory results, medication lists, and appointment schedules, fostering patient engagement and enabling them to make informed decisions about their well-being (Vizer & Hall, 2016).

2.1.2.5   Billing and Coding

EHRs encompass features aimed at streamlining administrative tasks and reducing paperwork through integrated billing and coding functionalities(Huawei, 2023). These capabilities enable healthcare providers to efficiently manage financial aspects of patient care, optimising the overall administrative workflow.

2.1.3   Stakeholders of Electronic Health Records Systems

Electronic Health Records (EHRs) have gained prominence in healthcare, necessitating an understanding of the diverse stakeholders involved (Høstgaard et al., 2017). Understanding the perspectives and needs of these stakeholders is vital for successful EHR initiatives and the realisation of their potential benefits in healthcare delivery (Amend et al., 2022).

2.1.3.1   Healthcare Professionals

Healthcare professionals, including physicians, nurses, and other care providers, are primary stakeholders in EHR implementation. Their engagement and acceptance of EHR systems are crucial for successful adoption and utilisation. This section examines the perspectives and challenges faced by healthcare professionals in relation to EHRs, including concerns about

workflow disruption, user interface design, data entry burden, and the impact on patient care and clinical decision-making(Amend et al., 2022).

2.1.3.2 Patients
Patients have become increasingly engaged in their own healthcare through access to EHRs. This section delves into the evolving role of patients as stakeholders in EHRs, exploring their expectations, rights, and benefits. Patient-centred care, privacy and security concerns, health literacy, and patient empowerment are key areas examined within this stakeholder group(Amend et al., 2022).

2.1.3.3 Healthcare Organizations
Healthcare organisations play a pivotal role in EHR implementation and management. This section explores the perspectives of healthcare organisations, including hospitals, clinics, and healthcare networks. Areas of focus include the organisational impact of EHR adoption, financial considerations, change management, interoperability challenges, and the potential for quality improvement and cost savings(Amend et al., 2022).

2.1.3.4 Policy Makers
Policymakers at local, regional, and national levels have a significant influence on EHR adoption and use. This section examines the regulatory landscape and policy initiatives surrounding EHRs, including legal frameworks, standards and certifications, privacy and security regulations, and incentive programs. Understanding the perspectives and motivations of policymakers is critical for shaping effective EHR policies and guidelines(Amend et al., 2022).

2.1.3.5 Information Technology Vendors/Suppliers
Information technology vendors play a crucial role as stakeholders in EHR systems. This section analyses the perspectives and interests of vendors, exploring their contributions to EHR development, system customization, support services, interoperability solutions, and financial considerations. The vendor perspective is vital for understanding the technical aspects and market dynamics of EHRs(Amend et al., 2022).

2.1.3.6 Researchers
Researchers form an essential stakeholder group in the EHR domain, contributing to evidence-based practice and the advancement of EHR science. This section examines the role of researchers in studying EHR implementation, usability, clinical outcomes, and the impact on healthcare delivery. Research priorities, methodologies, and challenges faced by researchers in the field are also explored(Amend et al., 2022).

2.2 Adaptive Structuration Theory

Adaptive Structuration Theory (AST), developed by DeSanctis and Poole in (1994), serves as a framework for analysing how group communication and decision-making processes are influenced by technology. This theory extends Anthony Giddens' Structuration Theory, which is a sociological concept focusing on the formation and maintenance of social systems through human actions. Giddens' theory, established in 1984, posits that social systems are composed of structures that are both the medium and outcome of human actions(Giddens, 1984). These structures, comprising rules and resources, facilitate or constrain human behaviour and are

characterized by three dimensions: signification (meaning), domination (power), and legitimation (morality).

Giddens challenges the notion of structures as static external factors, arguing instead that they are internalized and actively used by individuals in their actions. This process, known as "structuration," involves the continuous creation and recreation of social systems through human activities. It suggests a reciprocal relationship where human actions are shaped by structures, which are, in turn, modified by these actions(Giddens, 1984).

DeSanctis and Poole's adaptation of this theory, AST, specifically examines the role of technology in group dynamics(1994). In AST, technology is viewed as a type of structure that provides rules and resources for group actions, influencing group interactions and outcomes in terms of quality, accuracy, speed, and satisfaction. However, technology is not deterministic; rather, it is appropriated by groups based on their objectives, preferences, and contexts. This appropriation involves adapting, interpreting, and applying technology in various ways, influenced by emerging group structures like norms and power dynamics(DeSanctis & Poole, 1994).

AST is particularly relevant for this research as it emphasizes the interplay between technology, its appropriation, and the resulting structures. The theory suggests that technology presents a set of potential actions, termed the "spirit of technology," which encapsulates the intentions of its creators. However, the realization of this spirit depends on how groups appropriate the technology, shaped by their own evolving social structures. This concept of adaptive structuration, the modification of social systems through technology-mediated group actions, is central to understanding the impact of technology on group behaviour(DeSanctis & Poole, 1994).

2.3 How the theory of Adaptive Structuration is used.

In the context of this research, AST is fitting as it allows for an in-depth examination of how the implementation of EHR systems in a Chinese hospital setting is influenced by and influences the behaviours, interactions, and structures within the organization. It provides a lens to understand how technology is not just passively received but actively shaped and redefined by the users, in line with their goals, practices, and the organizational context. This perspective is crucial in comprehending the complexities and dynamics involved in the routinization of EHR systems, highlighting the reciprocal influence between technology and human agency within the organizational framework.

In the specific case of the study where the implementation of Electronic Health Records (EHR) systems in a Chinese hospital has already occurred, the focus shifts from studying appropriation to concentrating on the remaining four aspects of Adaptive Structuration Theory (AST). Since appropriation – the initial adaptation and adoption of technology by users – is already completed, the research delves into how the EHR system is integrated and routinized within the existing organizational structures and practices(DeSanctis & Poole, 1994; Liang et al., 2021).

2.3.1   Role of Social Structures

Post-implementation, the research examines how the EHR system has influenced or been influenced by the hospital's social structures. This includes understanding changes in communication patterns, decision-making processes, and the roles and responsibilities of healthcare professionals. The study explores how the EHR system may have redefined power dynamics or altered the traditional workflow within the hospital setting(Alsyouf & Ishak, 2018).

2.3.2   Examining the Dynamic Interaction between Technology and Users

After the EHR system has been implemented, its ongoing interaction with users becomes a focal point. This involves observing how healthcare professionals engage with the system during their routine activities and how this engagement evolves over time. The study seeks to understand the long-term effects of EHR system use on clinical practices, user satisfaction, and overall healthcare delivery(DeSanctis & Poole, 1994).

2.3.3   Feedback and Adaptation

The research pays close attention to the feedback loop that occurs once the EHR system is in use. Feedback from healthcare professionals about the system's functionality, efficiency, and user-friendliness can lead to further adaptations in the technology. This aspect of the study is crucial for identifying areas where the EHR system may require modifications or upgrades to better suit the needs of its users and the organizational context(DeSanctis & Poole, 1994).

2.3.4   Contextual Relevance

Given that the implementation has already taken place, the study focuses on how the EHR system fits within the specific context of the Chinese healthcare environment(Liang et al., 2021). This involves understanding the regulatory, cultural, and organizational factors that influence the ongoing use and effectiveness of the EHR system. The research explores how these contextual elements affect the integration of the EHR system into daily practices and its acceptance by the healthcare professionals.

2.3.5   Conclusion

By focusing on these four aspects, the study aims to provide a comprehensive understanding of the post-implementation phase of EHR systems in the hospital. It seeks to uncover the deeper implications of how such a system, once implemented, becomes an integral and routine part of the healthcare delivery process, influenced by and influencing the existing organizational structures and practices.

2.4 Conceptual Framework for Examining EHR Routinization

This manuscript presents a framework informed by Adaptive Structuration Theory (AST) with the aim of examining the performance of Electronic Health Record (EHR) systems.

EHRs have the potential to reshape healthcare practices, but assessing and improving their performance is a complex endeavour. The proposed framework integrates insights from AST, merging perspectives from user experience and organisational efficiency. It encompasses dimensions such as system usability, data quality, interoperability, clinical decision support, workflow integration, and patient outcomes. Through the lens of AST, this framework offers researchers and practitioners a comprehensive method for evaluating EHR performance and developing strategies for enhancement. The application of this framework holds significant implications for both research and practice, as it facilitates a holistic evaluation of EHRs, ultimately contributing to improved healthcare delivery and enhanced patient outcomes.

2.4.1   Technology and Structures

EHR systems introduce new technological structures comprising capabilities, functionalities, and potential improvements in healthcare processes. These structures, as conceptualised within AST, are infused with "spirit of technology," which signifies the inherent intents and possibilities embedded in the technology's design. This technology-driven structure constitutes a dynamic framework for EHR adoption within the hospital(Liang et al., 2021).

2.4.2   Human Agency

Adaptive Structuration Theory highlights the pivotal role of human agency in the adoption and routinization of technology. In the context of EHRs, healthcare professionals, administrators, and other stakeholders play a central role in appropriating EHRs to align with their specific needs, practices, and objectives. The adaptation and transformation of EHR systems are contingent upon the interpretation and reconfiguration of these technologies by hospital staff, influencing their integration into daily operations(Kruse et al., 2018).

2.4.3   Organisational Structures and Context

The organisational structures within the hospital encompass established practices, norms, roles, and communication patterns. These structures, combined with the adoption of EHRs, form an intricate interplay that shapes the routinization process. As healthcare professionals incorporate EHRs into their routines, they dynamically adapt, modify, and even challenge existing organisational norms, thus reinforcing or reconfiguring the prevailing structures(Liang et al., 2021).

2.4.4   Interplay and Evolution

The process of EHR routinization can be comprehended as an ongoing dialogue between technology, human agency, and organisational structures. This interplay leads to the formation of new practices, routines, and conventions that represent the ongoing evolution of the EHR integration process within the hospital setting(Kruse et al., 2018).

2.4.5   Implications for EHR Routinization

Applying the AST framework to study EHR routinization in a Chinese hospital offers a comprehensive perspective that recognizes the reciprocal influences of technology, human agency, and organisational structures. This framework underscores that EHR integration is an adaptive process driven by the dynamic interplay of these dimensions. By investigating how healthcare professionals adapt, appropriate, and transform EHRs within the organisational context, this study seeks to unravel the nuanced mechanisms underlying the routinization process. Ultimately, this approach contributes to a deeper understanding of how EHRs become embedded and operationalized within the routine practices of the Chinese hospital(Liang et al., 2021; Xiang & Li, 2014)

In summary, this study adopts the Adaptive Structuration Theory as a guiding framework to examine the EHR routinization process within a Chinese hospital. Through this lens, the interplay between technology, human agency, and organisational structures is explored, shedding light on the multifaceted dynamics that contribute to the integration of EHRs into routine healthcare practices.

3 Research Methodology

In this chapter, the chosen research approach for the study is explained and justified. The research journey began with a thorough examination of existing literature, which led to the development of a conceptual framework that aimed to enhance our comprehension of Electronic Health Records (EHR). This chapter provides a comprehensive account of the entire process, encompassing the selection of participants, data collection, interview guidelines, data analysis, research quality, and ethical considerations.

3.1 Research Strategy

The primary objective of this research is to explore the routinization of Electronic Health Records (EHR) systems within the Chinese healthcare context, focusing on the experiences and perceptions of healthcare professionals, specifically physicians and nurses. Through in-depth interviews, this study aims to understand the ongoing integration and normalization of EHR systems in China's healthcare sector, providing insights into the future trajectory of healthcare digital transformation in the region. The study is cantered on understanding the socially constructed realities of healthcare professionals as they interact with and adapt to EHR systems in their daily practices.

Guided by a phenomenological research philosophy, this study seeks to delve into the lived experiences and subjective interpretations of healthcare professionals regarding EHR systems. This approach is instrumental in uncovering the nuanced perceptions and attitudes of individuals who are directly engaged with EHR systems, offering a deeper understanding of the complex dynamics involved in the routinization process. The phenomenological methodology, emphasizing direct observation, description, and analysis, is employed to capture the essence of these experiences in the real-world setting(Okuda, 1976).

In conducting this research, the phenomenological approach emphasizes detailed observation and description while maintaining an objective and neutral stance. This methodology minimizes the influence of preconceived theories or frameworks, allowing for a more authentic exploration of the participants' experiences. Semi-structured interviews are utilized to encourage healthcare professionals to freely express their views and opinions, thereby enabling a comprehensive understanding of the routinization of EHR systems from the perspective of those who use them daily.

3.2 Research Approach

This research employs a qualitative methodology, which is particularly suited for exploring human behaviour, as highlighted by Patton (2015). The nature of the research question and the underlying philosophical approach align well with a qualitative interpretive framework.

The primary goal of this study is to capture, discuss, and elucidate the viewpoints and inter-pretations of the participants involved. While a quantitative method could offer some insights, the depth and complexity of the research topic necessitate a qualitative approach.

This approach enables the provision of detailed descriptions and in-depth explanations. It also serves to complement the extensive CHIMA survey(National Health Commission of the People's Republic of China, 2022) and by Liang et al (2021). A key aspect of this study is the exploration of diverse interpretations, both from the participants and the researchers. This necessitates a rigorous approach to ensure the accuracy and thoughtful analysis of the find-ings, which is essential for preserving their validity.

3.3 Data Collection Respondents

To fully understand the use of the hospital EHR system, the advantages and disadvantages found in the use, etc. We use interviews to collect unstructured data by asking people ques-tions. The interview was conducted via the video calling function of the WeChat platform. When conducting an interview, not only use text to transcribe the interview, but we can also use photos or videos to record the interviewee's expression or body language to supplement the text description. Because written records will not be completely accurate (Gibbs, 2018). In this way, we can have a good visual interaction directly with the interviewees. Since the inter-viewees are all in China and need to work during the day, most of the interviews were con-ducted in the afternoon of Stockholm time.

3.3.1   Research Background

The Affiliated Hospital of Yangzhou University (Yangzhou First People's Hospital) was founded in 1960. It is the only directly affiliated hospital of Yangzhou University. After con-struction and development, it has become a comprehensive third-class hospital integrating medical treatment, teaching, scientific research, first aid, prevention, and rehabilitation. The hospital has 1,785 open beds and 42 open wards in the east and west districts. The hospital currently has 2,222 active employees. There are 50 first-level departments, 67 second-level departments, and 22 third-level departments. According to statistics in 2022 there were 1,517,400 outpatient and emergency visits in hospitals, and 76,100 discharged patients.

3.3.2   Respondents Information

Respondents for the study included 20 people with various job titles, roles and experiences. All interviewees were drawn from the same stakeholder group: working medical staff, in this case doctors and nurses, at the Affiliated Hospital of Yangzhou University, Yangzhou City, Jiangsu Province, China.

When selecting interviewees, we will mainly take into account the position and working years of the interviewees. Try to choose interviewees who work long hours and are in front-line jobs because their opinions and feedback are more representative and the most timely and reliable. But we also selected some newcomers who have just joined the company to reflect whether the EHR system is easy to learn and use for new users. We did not choose to inter-

view engineers and managers who develop or maintain EHR systems because this study is a qualitative survey of EHR users.

The selection process of interviewees began through WeChat, a Chinese online communication tool. We joined a hospital WeChat chat group through a doctor's referral. In the group we introduced the basic theme and purpose of the research and explained that interviews can be done anonymously. Many of the group members responded positively to our request and offered to be interviewed publicly. The interviewees were found through voluntary registration. Because the interviewees are all from the Affiliated Hospital of Yangzhou University. They all live in Yangzhou City, Jiangsu Province, China.

In the original plan of this study, it is planned to interview as many medical personnel as possible within the specified time. However, as the interview work progressed, we found that the information obtained in the later interviews tended to be the same. So, after we decided to end the interview after 20 people. After studying and analysing the interviews with the above people, we found that most of them answered the questions based on their own work experience. In order to better understand the impact of EHR systems on hospital organizational structures, we additionally interviewed three hospital managers.

3.3.3   Interview Structure Type and Interview Guides

This study adopts a qualitative research mode, using semi-structured interviews as the main data collection method. Semi-structured interviews are versatile and can be adapted to a variety of research settings. Using a semi-structured interview allows for more flexibility in the questions. During the interview, follow-up questions can be adjusted based on the responses of the interviewees. This allows the freedom to explore the topic in more depth.

The main purpose of this interview guide is to provide support for the interview. The interviews for this project were conducted in a semi-structured interview mode. In this way, we can flexibly make necessary adjustments according to the actual situation during the interview, so that the interviewees can freely express their views and opinions to receive as much information as possible.

Because both the interviewer and the interviewee are Chinese. Therefore, the interviews are conducted in Chinese to ensure that the interview questions can be understood and answered accurately.

Physician and nurse interview guide is about understanding and assessing current eHealth systems, usage, and perceptions. At the same time, consult medical staff about the future EHR system function outlook.

Introduction and warm up:

First, we start with a warm greeting and introduce ourselves. Explain the purpose of the study and the objectives of the study and provide a brief overview of the interview process, including expected duration.

Participants were then assured that their responses could be anonymous with their consent to participate in the study.

Background information: Collect some basic information about the respondents, such as gender, position, length of service, etc. Explore any relevant personal or professional background that may have influenced their views on the topic.

Advantages/disadvantages of EHR：Refers to system stability, compatibility, response speed, etc. Both strengths and weaknesses functions in EHR system include

Advantages/disadvantages of traditional handwritten medical records: As a comparison with the predecessor of the EHR system. Compare where the EHR system has improved to improve efficiency and where it is still lacking.

Use quality: Respondents' perceptions and experiences with EHR systems. Evaluation of services including system use training, software/hardware engineer support, etc.

Overall satisfaction: Discuss the need for an EHR system. Survey of Respondents' Overall Satisfaction with the Current EHR System

Outlook：Respondents discuss the functions they expect to add or improve in the EHR system in the future.

3.4 Data Analysis

To be able to effectively understand and process the collected interview records. We have to transcribe and process the data. Open coding can help researchers quickly extract, organize, and analyse large amounts of data, thereby improving research efficiency. Through open coding and converting data into visual forms through ATLAS.TI, researchers can more easily discover patterns and information hidden in the data (Miles et al., 2014).

To process data more efficiently. Some of the respondents' responses were modified. Because the spoken language used by some interviewees is unclear and meaningless, it needs to be corrected to a more correct written language. The meaning of the modified content has not changed, only to increase readability. We submit these changes to the interviewees and obtain their permission before adding them to the official document.

The coding phase began once the interview data had been transcribed. Interview texts are broken down into meaningful segments and codes are assigned to these segments. Codes are labels that represent a theme, idea, or concept. Then group and classify the codes. Group similar codes together to form categories or themes. Look for patterns, repetitions, and connections between code. Once the categories are complete, analyse the relationships between categories and distinguish between main categories and subcategories to form a more structured framework. Then explain the meaning behind each topic and category. Look for underlying patterns, connections, contradictions, and insights. Address research questions by weaving topics together to synthesise analysis to create a coherent narrative.

The advantage of qualitative analysis software is to improve the efficiency and depth of data analysis. Qualitative analysis software simplifies the process of data coding, classification, and analysis. It enables researchers to manage large amounts of qualitative data more efficiently than manual methods. Consistency can be maintained during software analysis. Once

codes and categories are established, they can be applied consistently across datasets, minimising bias, and ensuring rigorous analysis.

By open coding the interview script, the free nodes are shown in Appendix 6. The free nodes are further refined to form a categorization, and the open coding is shown in Appendix 7.

The categorization is further refined, and the main category is analysed, and there are five main categories, namely the advantages of traditional handwritten medical records, the disadvantages of traditional handwritten medical records, the advantages of EHR system, the shortcomings of EHR system, and the improvement measures of EHR system. Appendix 7 shows the connotations of selective coding, main categories, and corresponding categories.

Through the coding analysis, the advantages of the EHR system are mainly reflected in the orderliness, data informatization, real-time, speed, reliability, comprehensiveness, timeliness, rationality, standardisation, convenience, and security.

Orderliness is manifested in clear and orderly electronic medical records.

Data informatization is specifically manifested as a unique data format and centralised storage, which is conducive to the rapid input, rapid retrieval and query, call and processing of various diagnosis and treatment information, provides a large amount of integrated data for clinical, teaching and scientific research, is conducive to the sharing and exchange of information resources, and is also a comprehensive and reliable information for statistical analysis and hospital management, which greatly improves the utilisation efficiency of medical records. Real-time is specifically manifested in the patient's condition changes, examination conditions, treatment plans, etc. All can be monitored in real time, The rapidity is specifically reflected in the application of electronic medical records and computer information systems, which will greatly shorten the time and improve the quality of medical consultation.

Reliability and comprehensiveness are specifically manifested in the comprehensive electronic medical record template and reliable electronic medical record content. Timeliness is specifically manifested as reasonableness, which is specifically manifested in the timely sending of critical value data to doctors. There is no timely processing of critical value data anytime, anywhere, timely viewing of the patient's expenses, timely communication with the patient, when the doctor writes the doctor's order to the patient, the electronic medical record system will review the doctor's order or prescription according to the patient's drug allergy, and if there is a conflict, it will warn the doctor in time and ask him to re-issue the medical order or prescription.

Rationality is specifically manifested in drug dose, drug concentration, route of administration, etc. can be checked rationality through the system. The normative system is specifically manifested in the fact that the electronic system can standardise the diagnosis and treatment behaviour of doctors, refine the management of physicians, reduce medical costs, and improve the rate of diagnosis and treatment.

Convenience is specifically reflected in the fact that patients in the same hospital can establish permanent electronic files, which is convenient to view results and improve work efficiency; The EHR system is more convenient to retrieve and use, and electronic medical records can be copied and pasted, greatly reducing repetitive work; Information exchange between upper

and lower level hospitals is carried out through the EHR system to improve the medical level of primary hospitals.

Safety is specifically manifested in the fact that 6% of patients receive the wrong treatment, the doctor's handwriting is illegible, and the errors of nurses and patients are the main reasons. Electronic medical records minimise the occurrence of such errors.

Through the coding analysis, the shortcomings of the EHR system are mainly reflected in the danger and time-consuming. The risk is specifically manifested in the risk of leakage of the patient's medical records, and the inability of the doctor's order change system to remind the lack of drugs in time, which may delay the patient's treatment time; The phenomenon of copying, pasting and copying electronic medical record documents seriously relies too much on the copy and paste function of the electronic medical record system, which increases the probability of recording medical records that do not match the patient's information.

Time-consuming is specifically manifested in the slow operation speed of the computer, which reduces the speed of diagnosing patients to a certain extent. Through interviews with medical staff, we learned that although the EHR system is more convenient, faster and more efficient than traditional handwritten medical records, there are certain problems. By dissecting the problem, the direction of EHR system improvement is found. Improvement measures specifically improve in terms of intelligence, system speed, training, coverage, and standardisation.

The improvement of intelligence is mainly reflected in the suggestion to add the logic review and error prompt functions of the intelligent medical record quality control system. Add electronic wearable devices to record patients' vital signs and automatically enter them into the electronic medical record system; Add more clinical auxiliary decision-making support, such as whether the diagnosis of the disease matches the drug prescribed by the doctor, and whether the diagnosis of the disease is consistent with the doctor's condition record; It is recommended that drug manufacturer systems must be able to provide advance warning of drug scarcity; Increase the function of the system to independently and automatically select similar drugs and replace the used drugs; Add the function of reminder time logic to prompt whether the logic is wrong or whether the details are ignored; Add the function of prompting inspection items or drugs beyond the scope of the medical insurance catalogue and recommending items within the scope of medical insurance; Add the ability to provide a knowledge base, automatically review medical orders or prescriptions, etc.

The improvement in system speed is mainly reflected in the acceleration of computers. Launch more advanced electronic supporting products. The improvement in training is mainly reflected in the increase in the training time of the EHR system and the enrichment of the training manual.

The improvement in coverage is mainly reflected in the hope that the electronic medical record system will establish a total national store, and if authorised by the patient, the patient's records can be viewed if necessary.

The improvement in standardisation is mainly reflected in the suggestion that the implementation of electronic medical records can be premised on the standardisation of international medical terminology. Formulate uniform rules for the name, basic format, medical terminology, transmission method, image compression, etc. of electronic medical records. Establish

uniform codes such as address codes, occupation codes, home codes, medical facility codes, and more., forming regional, national, and international standards, so that the writing of medical records is standardised and standardised.

3.5 Research Quality

3.5.1   Validity

Qualitative research is a method for understanding complex phenomena, exploring subjective experiences, and obtaining rich, contextualised data. While qualitative research does not employ statistical generalisation like quantitative research does, it can emphasise validity by employing various strategies. Only in this way can the research results have credibility and rigour.

We use triangulation to cross-validate and corroborate findings using multiple data sources, methods, or researchers. Only when the data obtained are complementary, consistent and coordinated can the conclusions drawn be sufficiently reliable (Moran-Ellis et al., 2006). Increase the credibility and validity of its interpretations and conclusions by collecting data from different perspectives and employing various data collection methods such as interviews, observations, and analysis of documents.

Qualitative research emphasises providing a rich and detailed description of the context of the investigation, the participants, and the research. Our exhaustive description of the interview process enables readers to understand the research context and participant experiences and the complexities and nuances that enhance the validity of the findings.

3.5.2   Reliability

Qualitative research requires as much as possible to follow a consistent and well-defined methodology throughout the research process. Ensure that the logic of the research process and data analysis is clear and unambiguous so that other researchers can understand and replicate the research results(Maxwell, 2013). This includes clearly defining research questions, selecting appropriate data collection methods, and consistently applying data analysis techniques. The reliability of our findings can be increased by maintaining consistency in the research process.

We also maintain sound records and documentation of all interviews. For other researchers and readers to review and assess the reliability of our research.

3.6 Ethical Considerations

Ethical issues have always been an integral part of research. In this project research, we fully respect the privacy and the right to know of the interviewees. The objectives of the interview and the scope of the interview should be clearly communicated to the interviewee prior to the interview. Also inform the interviewee how we will apply the information gathered in this

interview. If they wish to withdraw the information provided, we will do so unconditionally. At the same time, we will delete or obfuscate any content that involves the privacy of others during the interview.

Before conducting the interview, we also informed the leaders of the hospital about our research plan and the details of conducting the interview. Interview permission was obtained from the hospital and our research reports were readily available for review.

Honesty comes first when it comes to research writing. No matter what kind of content we will faithfully record and present in this paper, even if there is a big difference with our expected results.

3.7 Limitations

This study, while providing valuable insights, is subject to certain limitations. The scope of the interviews was confined to a single, top-tier public hospital in China. Consequently, the findings may not be generalizable to other hospital types, such as secondary public hospitals, community hospitals, or private healthcare institutions. Additionally, the methodology employed a single interview session per participant, without subsequent follow-up interviews, which could have enhanced the reliability and depth of the research findings.

The experiences and perceptions of Electronic Health Records (EHR) systems can vary significantly across hospitals of different sizes and types, potentially influencing the evaluations of hospital staff and management regarding these systems. This variation was not fully explored in the current study.

Furthermore, the regional focus of this study limits its applicability to the broader global context. The findings may not accurately reflect the implementation and use of EHR systems in other developed or developing countries.

Lastly, the development of the interview questions was based primarily on the personal experiences and discussions among the authors. This approach, while grounded in practical experience, may lack the rigor and specificity typically associated with more academically driven research in the field of medical informatics.

4 Empirical Findings

Verification results will be the subjective interview content extraction and analysis results. Empirical findings show respondents' views and perceptions of each category.

4.1 Comprehensive Popularisation of the EHR system

EHR systems have been around for decades. However, the high equipment cost of the EHR system made us expect that compared with developed countries, the application time of EHR systems in developing countries like China will not be too long. The survey results show that the survey target hospitals have fully replaced the traditional handwritten medical record mode with the EHR system a long time ago. Among the 20 interviewees, only physicians with more than 15 years of practice experience had handwritten medical records. Young physicians use the EHR system from the beginning of their practice.

According to interviews and surveys, it is not difficult for older physicians to learn and use the EHR system. Physicians up to 6 months old are fully acclimated and proficient in the use of EHR systems even with little computer and electronics experience (A1, A4, A7, A11, A14, A16, A18). Most physicians can fully master the EHR system within 1 to 3 months. For the younger generation of physicians who are familiar with modern electronic systems, the EHR system is completely easy to use (A2, A6, A13).

The first thing the EHR system brings is standardisation. Even with the help of standard forms, traditional handwritten medical records cannot be completely standardised because each doctor has different writing habits. Doctors' handwritten medical records are often illegible and irregular in format, which cannot guarantee the integrity of the data and is difficult to analyse and compare.

"Paper medical records are completely handwritten by doctors, and the handwriting is illegible and difficult to read. Electronic medical records are clear and orderly, convenient and quick." (B19)

Compared with European and American hospitals, daily quotas are generally used to consult patients. To maximise the efficiency of the use of medical resources, Chinese hospitals require physicians to provide diagnostic services to as many patients as possible during working hours. This puts doctors under great work pressure and time pressure. Traditional handwritten medical records require physicians to search for them by themselves, and handwritten records are required after the diagnosis is completed. This took almost half of the diagnostic time. And under the high intensity handwriting work, physicians will inevitably have scribbled handwriting and recording errors. This could lead to serious medical malpractice.

After adopting the EHR system, doctors can be freed from the heavy work of handwriting medical records. Many places that require repetitive labour can only be completed by copying

and pasting. At the same time, the EHR system will also provide a medical record template to help doctors quickly complete the electronic medical records of routine patients.

"During the period of handwriting medical records, it is impossible to access the medical records that were previously seen in our hospital. I am an endocrinologist, and I can't use more or less medicine for diabetes. I can see the medical records of my previous medical treatment in our hospital, which greatly improves the quality and efficiency of my work" (A4:L8)

The EHR system has also greatly improved the efficiency of physicians in retrieving and reviewing medical records. From the previous page-by-page manual review to just entering keywords in the EHR system to view the required content, the efficiency has been improved several times.

"The patient's previous visits can be retrieved, and various inspection results can be seen in the electronic medical record system more quickly." (A1, L10)

EHR systems are also more conducive to the preservation of patient health records. In the past, paper medical records required a huge medical record room for storage. These paper documents are very prone to loss and damage. The EHR system only needs to use the hard disk for storage and can easily create multiple backups to prevent unexpected situations. Physicians only need to use their own equipment terminals to complete the access to medical records. At the same time, the EHR system standardises and standardises medical record information. All information is classified and stored in a standard manner. Make sure all information is clear and accurate.

"I work in the medical record room now. Although paper medical records have a unified home page, writing format, and medical document writing regulations, the writing is very random, and it is difficult to standardise the medical records written by different doctors. The implementation of electronic medical records is based on the standardisation of medical terminology. The names of diseases, basic formats, medical terms, transmission methods, image compression, etc. of electronic medical records are formulated as unified rules, and uniform codes are established for various basic conditions in medical records, such as address codes, occupation codes, family codes, and medical facility codes Etc., forming regional and national standards, so that the writing of medical records can be standardised and normalised."(A18,L10)

The EHR system not only digitises paper health records, but also provides many new functions to assist physicians in diagnosis. When asked what the most popular function of the EHR system is, many physicians mentioned the function of the EHR system to check the rationality of prescriptions:

"In clinical practice, most patients will take several drugs at the same time. Due to the interaction between drugs, when patients receive two drugs at the same time, drug toxicity may occur. Therefore, the rationality check of drug dosage, drug concentration, and route of administration is also an important function of clinical decision support. one. Great convenience for our young doctors." (A6, L6)

In many cases, patients need to use multiple different drugs for treatment at the same time. However, some drugs cannot be used at the same time because the chemical components in

them can interact to make the drugs ineffective or even produce toxins. With the progress of science, more and more types of drugs are produced. Physicians cannot memorise contraindications to all medications. EHR systems can automatically check prescriptions and search databases to determine whether the drug use in prescriptions is reasonable. If there is a potential risk, the doctor will be warned in time to avoid medical accidents caused by wrong medication.

EHR systems also help physicians provide patients with more economical treatment options. Reduce unnecessary medical expenses while ensuring the quality of medical care:

"Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription, and prompt when there are inspection items or drugs that exceed the scope of the medical insurance catalogue. If there are items outside the scope of medical insurance, items within the scope of medical insurance are recommended for physician decision-making." (A7, L14)

"When the patient is determined to have a certain disease, the electronic medical record system can generate various doctor's orders and inspection and inspection application list options for the doctor according to the clinical path, so that the doctor can choose and adjust according to the actual situation. Through the clinical knowledge base based on clinical pathways, it is possible to standardise physicians' diagnosis and treatment behaviours, fine-tune management of physicians, reduce medical expenses, and improve the efficiency of diagnosis and treatment." (A8, L8)

The EHR system has also brought huge changes to the hospital's organizational structure. Before the implementation of electronic medical records, physicians processed medical record data manually, often with the help of trainee physicians. The hospital has a traditional archives department to classify and store data.

After the implementation of EHR, specialized personnel are no longer needed to organize data, and the archives department is transformed into a comprehensive digital information department responsible for EHR maintenance and management. This shift represents a change in the social structure within the hospital. The introduction of electronic medical record systems has changed staff roles and responsibilities, leading to a redefinition of work processes and departmental functions. The technology (EHR system) acts as a new structure that both supports and constrains action, leading to a reconfiguration of organizational practices.

The introduction of EHR systems has changed the way information is managed, impacting traditional workflows and structures within hospitals. Cross-department collaboration becomes more feasible, reducing the time and costs associated with communication. Let more people enjoy better quality medical services. EHR systems introduce new rules and resources that enable and constrain actions, resulting in new patterns of interaction and collaboration across departments. The technology becomes the medium through which organizational structures are created and used.

Individuals within the hospital adjust their behaviour to the capabilities and limitations of the EHR system, thereby influencing both the technology and their own behaviour. Improve your medical skills more scientifically. While providing high-quality medical services, they can independently reduce unnecessary expenses for patients. EHR systems, as new technological

constructs, offer new capabilities (e.g., data analytics, reporting tools) that impact management practices. In turn, these practices determine how the technology is used, creating a continuous structured cycle.

The use of EHRs makes quality and performance measurement more intuitive and effective, impacting how success and improvements are tracked and managed. Leadership can supervise employees through a flat management approach. Government agencies can more efficiently investigate hospital compliance and issue guidance. EHR systems not only change the way work is done, but they also require new skills and facilitate new forms of collaboration and management, reflecting the dynamic interplay between technology, people, and organizational structures.

4.2 User Experience Improvement Needed

EHR systems were not very popular in their earliest days. Especially among older physicians. This group has become accustomed to using a handwritten medical record model. And because of age and literacy level, learning to use electronic systems is not as fast as young people.

"I am older, and I have formed a fixed habit of writing by hand for decades and only memorise the most important content. Before using electronic medical records, I seldom used computers, so the transition period from handwriting to electronic medical records was a bit long. The electronic version of the medical record has a fixed template, which is more comprehensive, but it takes too much time to fill in each item."(A1,L8)

Young physicians who do not have such troubles all said that they can quickly start using the EHR system(A2,A6,A13).

But as technology advances, EHR systems are becoming easier to use. According to feedback from multiple physicians, the EHR system used in the hospital has completed three large-scale upgrades in the past 15 years. Older physicians can use the EHR system well after a period of adaptation.

Physicians should be trained to familiarise themselves with the EHR system when using the new system. But our investigation found that such training is only one or half a day. Almost all physicians interviewed indicated that the training period was too short. Many functions need to be explored by yourself or consulted with software engineers. This increases the difficulty of their work. At the same time, the training materials are too simple to fully cover all common functions.

In addition, we received feedback from physicians that the least favourite aspect of the EHR system is that it is slow. After investigation, we found that the reason was that the hospital's hardware update cycle for the EHR system was too long to keep up with the rapid software update. It is not that the hospital lacks funds and willingness to update hardware, but as the highest-level hospital in the region, it needs to receive a lot of patients every day. It is hard to find free time for hardware upgrades. Therefore, it is difficult for the EHR system to update the hardware in a short period to improve the speed when it is not necessary. The same is true

for the short training time of doctors. If a large number of doctors participate in long-term training at the same time, the hospital will not be able to operate normally.

The current EHR system is not perfect. There are still many details that need to be improved. During the interview, we noticed that some physicians suggested that the EHR system has logical flaws in some functions:

"Order sets are great, but they have flaws. The drug replacement system in the doctor's order set cannot be reminded in time until the drug is not available."(A12,L14)

4.3 Future Improvements

The current EHR system is not perfect. The emergence of new technologies has brought more possibilities to the EHR system. Physicians are also looking forward to the future of the EHR system. When asked about the vision of the future EHR department functions in the interview, cloud services or unified databases were mentioned the most:

"*It is hoped that the EHR systems of different hospitals have a unified database to see the medical records and medication status of patients in different hospitals.*"(A3,L24)

More than half of physicians want this feature to be implemented as soon as possible. Although the EHR system has been widely used, each hospital's EHR system service provider is not the same. The EHR system used is not compatible. Therefore, when patients are transferred for treatment, they still need to carry the printed medical records to the next hospital as they did decades ago. This brings very heavy input work to the doctor. And when the patient carries paper documents, it is also easy to lose the situation. If a unified national database can be achieved, then patients can avoid the trouble of carrying heavy data. Physicians can also find patient information at any time to achieve seamless docking.

Another feature frequently mentioned in interviews is wearables assisting physicians in recording:

"*If there is voice recognition, it would be great if I can automatically enter the electronic medical record when I ask.*"(A7,L22)

The application of wearable devices can bring further convenience to physicians. Help them complete the entry of diagnosis results with language or body movements. At the same time, wearable devices can also be applied to patients to detect physical indicators at any time and record them in the EHR system. Eliminate the trouble of doctors needing to check the patient's physical condition.

With the rapid development of artificial intelligence, this technology is gradually having an impact on EHR systems. AI can enable efficient data entry through speech recognition and natural language processing, making it easier for healthcare professionals to enter and access patient data. It is also possible to conduct predictive analysis through patient history data to detect diseases and potential complications early and propose appropriate diagnosis and treatment plans to improve the accuracy of medical decision-making. Some doctors mentioned that artificial intelligence hopes to help them reduce their workload:

"It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like ChatGPT to help doctors make good use of the electronic medical record system." (A17, L22).

4.4 Summary of Findings

The Electronic Health Records (EHR) system has been extensively implemented in high-level hospitals across China, significantly enhancing the efficiency of medical professionals and reducing the manual burden of tasks such as documentation and organization. This advancement allows physicians to concentrate more on patient care rather than on repetitive, lower-level tasks. EHRs are not merely electronic versions of paper records; they are comprehensive digital profiles providing detailed health information about patients. These systems facilitate the sharing of information across various healthcare entities, including laboratories, specialists, medical imaging facilities, pharmacies, emergency services, and clinics in schools and workplaces, thereby diminishing informational barriers and augmenting communication efficiency. EHRs also streamline healthcare delivery for doctors, nurses, and patients, offering easy access to patient data and improving the storage of medical information. With ongoing updates, EHR systems have evolved beyond simple data storage and retrieval, actively aiding in diagnostic and treatment decisions. They can track a patient's medication and allergy history, automatically flag potential conflicts with new prescriptions, and swiftly identify safety risks, aiding physicians in preventing more severe patient outcomes.

EHR systems have fundamentally altered organizational practices, roles, and interactions in healthcare settings, exemplifying the dynamic relationship between technology, human agency, and organizational structures. They necessitate new skills, foster novel forms of collaboration, and influence management practices.

However, current EHR systems have limitations. Their design often relies on basic database logic, offering limited assistance with complex medical issues. Additionally, infrequent hardware updates can hinder the system's overall performance.

Looking ahead, physicians anticipate that the future of EHR systems will involve wearable devices, cloud services, and artificial intelligence. Wearable devices could offer more flexible operation compared to traditional keyboard and mouse interfaces, enhancing efficiency and enabling continuous health monitoring. Cloud services have the potential to facilitate real-time, cross-hospital collaboration and treatment, breaking down existing barriers in information exchange. Artificial intelligence is expected to play a more integral role, moving beyond fixed logic to provide more precise recommendations based on extensive historical treatment data, thereby improving treatment outcomes and reducing risks of misdiagnosis or incorrect medication.

5 Discussion

This study delved into the process of routinization concerning the implementation of the Electronic Health Records (EHR) system at Yangzhou University Hospital, guided by the lens of the Adaptive Structuration Theory (AST). Our inquiry has yielded valuable insights into the significant challenges encountered across the EHR's design and operational integration. It is essential to highlight that the ensuing discussions are arranged to elucidate event connections, reflecting the AST framework's lens.

5.1 Interfacing System

The issue of interoperability between hospitals, which is iconic in this case, was raised by multiple doctors. However, this observation contradicts the statement made by the hospital's EHR system supplier Huawei (2023), who claims that their systems are used by 1800 hospitals with access to other major hospital EHR system(De Mello et al., 2022)s.

To gather further insights, we reached out to several interviewees who requested confidentiality (see Appendix 4). They indicated that the core problem lies in the absence of a national or industry standard for EHR systems, leading to challenges in achieving interoperability between different systems(Kaipio et al., 2017). EHR system suppliers who do not have a contract with the doctors' practising hospital often refuse to collaborate on interoperability unless financial incentives are provided.

An important comment made by one of the interviewees is that the decision regarding which EHR system service to purchase is often determined by the district or regional administration, rather than the hospitals themselves. Certain cities or provinces may have preferences for working with specific EHR suppliers(Xiang & Li, 2014). This finding aligns with Huawei's statement(2023), claiming widespread usage of their system in certain provinces and by specific medical groups. It is also supported by the quantitative rating in the CHIMA (Liang et al., 2021), where higher interoperability ratings are observed at the provincial level compared to the national level.

However, we contend that the industry-wide approach, which has been successful in numerous cases, may not be applicable in the Chinese context. While researchers often consider a unified industry standard as a recognized solution (Gottumukkala et al., 2022; Shrivastava et al., 2019), our interviews reveal a different decision-making process regarding EHR system contracts in China. The dilemma occurs when standards must conform to regional requirements and align with suppliers' interests. This task is particularly challenging due to the absence of many regional regulations pertaining to EHR standards and the effective regulatory power over them(Høstgaard et al., 2017). The implementation of a new Electronic Health Records (EHR) standard by a regional government poses a potential risk for hospitals and EHR suppliers, as it may necessitate a complete restart of the system. This scenario entails significant challenges and potential disruptions in terms of system compatibility, data migra-

tion, training, and overall workflow adaptation. The need to conform to a new EHR standard imposed by regional authorities can require substantial investments of time, resources, and financial support. Therefore, hospitals and EHR suppliers must carefully assess the implications and potential consequences before embarking on the adoption of a new standard mandated by regional governments.

Hence, we propose that the most viable solution lies in establishing a national standard. The National Health Commission (NHC) has demonstrated its commitment to promoting national standards for EHR and other eHealth systems, as indicated by their recent (21 Finance, 2022), which underscores the relevant efforts made in this regard.

5.2 Routine Impact

The implementation of the new national Electronic Health Record (EHR) system has precipitated noteworthy resistance within the hospital staff, specifically concerning the maintenance and adaptation of diverse medical record templates. Contrasting the previous EHR system that leaned toward document-style record composition, the new system has foregrounded the significance of structured record formatting to streamline data collection, aligning with the mandates set forth by the national EHR system rating. However, this transition towards a more meticulously structured format has posed formidable challenges, resulting in an arduous and counterintuitive experience for the staff tasked with template maintenance, who find themselves entangled in a process surpassing mere copy-and-paste endeavours.

The novel EHR framework mandates the inclusion of designated input fields catering to specific elements encompassing date, chief complaint, symptoms, and signatures. Yet, this additional requirement has spawned a palpable reluctance and lack of collaboration within the staff cohort. While staff members do participate in training sessions, it becomes evident that the acquisition of the requisite skills is often not their primary objective. In a broader context, the author sheds light on an organisational shortcoming, wherein no distinct department shoulders the responsibility of template upkeep. This systemic void culminates in a labyrinthine procedure of traversing between disparate departments in pursuit of viable solutions, inadvertently breeding frustration and consuming valuable time.

In summation, the introduction of the new national EHR system, coupled with its emphasis on stringent record formatting, has encountered formidable resistance within the hospital staff. The intricate nature of the mandated alterations, compounded by the added effort entailed in integrating input fields, and exacerbated by the absence of a clear chain of accountability within the organisation, coalesce to form a potent amalgam fostering staff hesitance and impeding cooperation in the embrace of the emergent EHR paradigm.

5.3 Insight into routinization of EHR by similar scenarios

The implementation of Electronic Health Records (EHR) systems in developing or underdeveloped countries presents unique challenges and opportunities from an organizational and staff competency perspective. Using the Adaptive Structuration Theory (AST) framework,

this discussion explores the implications of EHR system implementation in these contexts, focusing on organizational structures and staff competency.

5.3.1   Organizational Structures in the EHR Context

In the pre-EHR era, healthcare providers in developing countries often grapple with limited resources and infrastructure. The manual handling of medical records, as observed in more developed settings, is also prevalent here but is compounded by resource constraints. The introduction of EHR systems, therefore, represents a significant shift in organizational structures.

The transition to EHR systems in these environments can be seen as an introduction of new technological structures that necessitate a reconfiguration of existing organizational practices. This shift, while promising enhanced efficiency and data management, also demands substantial changes in workflow and departmental functions. In settings where digital infrastructure is nascent, this transition can be particularly challenging, requiring significant investment in both technology and training.

5.3.2   Staff Competency and Technological Threshold

The requirement for technical proficiency with EHR systems introduces a new competency threshold for healthcare staff in developing countries. This demand is often juxtaposed against the existing skill levels and educational backgrounds of the healthcare workforce in these regions.

The AST framework suggests that the successful routinzation of EHR systems in these settings hinges on the effective appropriation of the technology by healthcare staff. This appropriation process is not merely about learning to use new software; it involves a fundamental shift in how healthcare professionals interact with patient data and make clinical decisions. The gap in required technical skills may necessitate extensive training programs and support systems, which can be a significant hurdle in resource-limited settings.

5.3.3   Cross-Departmental Collaboration and Communication

EHR systems have the potential to enhance cross-departmental collaboration in healthcare settings by providing a unified platform for patient data. In developing countries, where healthcare systems often suffer from siloed operations and fragmented care delivery, EHRs could offer a much-needed solution for integrated care.

The introduction of EHRs as a new structure within these healthcare systems can enable more streamlined and coordinated care. However, the success of this integration heavily relies on the extent to which the technology is appropriated across different departments. Challenges such as resistance to change, lack of interoperability, and varying levels of digital literacy can impede this process.

5.3.4   Management and Compliance

For healthcare leaders in developing countries, EHR systems offer tools for better management oversight and compliance with regulatory requirements. However, the effectiveness of these systems is contingent upon the alignment of EHR functionalities with local healthcare policies and practices.

The recursive nature of structuration in AST suggests that the impact of EHR systems on management and compliance is bidirectional. While EHRs provide new capabilities for monitoring and reporting, the actual utilization of these features depends on the existing management practices and regulatory environment. In developing countries, where healthcare regulations can be in flux, aligning EHR functionalities with these changing requirements presents an additional challenge.

5.3.5   Conclusion

The implementation of EHR systems in developing or underdeveloped countries, viewed through the lens of AST, underscores the complex interplay between technology, organizational structures, and human agency. While EHRs hold the promise of more efficient and integrated healthcare delivery, realizing this potential requires addressing the unique challenges these countries face in terms of infrastructure, staff competency, and organizational readiness. The success of EHR implementation in these contexts depends not only on the technology itself but also on the capacity of healthcare systems and professionals to adapt to and embrace these new digital tools.

6 Conclusion

The exploration of EHR system implementation at Yangzhou University Hospital, guided by Adaptive Structuration Theory, has unearthed several critical insights and implications.

6.1 Conclusions

This study focuses on the challenges encountered during the implementation and routinization of the Electronic Health Records (EHR) system at Yangzhou University Hospital. Key issues identified include the lack of interoperability between hospitals due to the absence of a national or industry standard for EHR systems in China, and regional biases influencing the decision-making process for EHR system contracts. The study also highlights resistance from hospital staff, particularly regarding the transition to a new, more structured format for medical record templates, which has been found user-unfriendly and challenging.

6.2 Future Research

Future research should explore the development and impact of a national standard for EHR systems in China, as proposed in this study. This includes examining how such a standard could facilitate interoperability and overcome regional biases in EHR system selection. Additionally, further investigation is needed into effective strategies for managing the transition to new EHR systems, especially in terms of user acceptance and training, to ensure smoother implementation and routinization processes.

6.3 Contribution

The study enhances the understanding of the routinization challenges of EHR systems in a Chinese healthcare context, emphasizing the importance of establishing a national standard for ensuring interoperability and minimizing regional disparities in the integration and sustained use of these systems. It brings to light the critical human elements in the routinization process of EHR systems, underscoring the need to address ongoing staff concerns, ensure continuous training, and define clear responsibilities for system upkeep and evolution. These insights are particularly valuable for policymakers, healthcare administrators, and EHR system developers, as they navigate the complexities of embedding EHR systems into the daily practices of healthcare delivery. The focus is on optimizing the long-term use and effectiveness of EHR systems to enhance healthcare delivery and patient outcomes, beyond the initial implementation phase.

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Appendix 1: Interview Guide for Healthcare Professional

Hello. Thank you very much for joining us for this interview. We will truthfully record your interview with us. After the interview you will receive a copy of our transcript of your interview. If you have any discomfort with the content of the interview, you can ask us to withdraw the interview at any time. We will do so unconditionally. At the same time, we will respect your privacy and remove records related to personal information when processing the original interview records. You can also participate in the interview anonymously. Let us start this interview:

1.History of use of EHR systems and handwritten medical records

-How long have you been using traditional handwritten medical records?

-How long have you been using an EHR system?

2. Advantages/Disadvantages of EHR Systems

-Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?

- Which main features do you find easy/difficult to use (why)?

3.The training and ease of use of the EHR system by medical staff

-How long did it took to transition from traditional handwritten medical records to an EHR system?

-Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?

-If you think the training is insufficient, point out where the training is deficient.

4.Improvement point of EHR system

-Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)

-Where do you think the EHR system can be advanced to meet the needs of more professionals?

5. Doctors / Nurse want functions in the future

-What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?

Thank you for accepting our interview. At the same time, thank you very much for your help in our research.

Appendix 2: Summary of Interview

Table 0.1: Interview outline

Topic	Subtopic	Question
Introduction		Please introduce yourself
Comparison of traditional medical records system and EHR system	Contrast	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
EHR system characteristics	Characteristics	In what ways does your current EHR system improve the quality of your patient delivery?
	Actual use	Where is it being used more efficiently (and why)?
EHR system use	Advantage	Which main features do you find easy to use (why)?
	Training situation	Have you received training in the use of the EHR system? If you think the training is insufficient, point out where the training is deficient.
	Challenge	Is it difficult to use the current EHR system?
Suggestions for future improvement	Function improvement	What features of the EHR system do you think could be improved?
	New function	What features do you think the EHR system has and what new features could be added?

Appendix 3: Interview Guide for Healthcare Professional, Mandarin Translation

你好。 非常感谢您接受我们的采访。 我们会如实记录您对我们的采访。 面试结束后，您将收到我们的面试成绩单副本。 如果您对采访内容有任何不适，可以随时要求我们撤回采访。 我们将无条件地这样做。 同时，我们会尊重您的隐私，在处理原始访谈记录时，会移除与个人信息相关的记录。 您也可以匿名参加面试。 让我们开始这次采访：

1.EHR 系统使用史及手写病历

-您使用传统手写病历多久了？

- 您使用 EHR 系统多久了？

2.EHR 系统的优点/缺点

- 将 EHR 系统与传统的手写病历进行比较，您认为各自的优缺点是什么，您更喜欢哪种系统？

- 您觉得哪些主要功能易于/难以使用（为什么）？

3.医护人员对 EHR 系统的培训和使用

-从传统的手写病历过渡到电子病历系统需要多长时间？

- 您是否接受过使用 EHR 系统的培训？ 如果有培训，是否足以帮助您有效地使用 EHR 系统？

-如果您认为培训不足，请指出培训不足的地方。

4.EHR 系统的改进点

-您认为当前的 EHR 系统在哪些方面可以改进，以更加人性化和易于使用？ （使用方便）

-您认为 EHR 系统可以在哪些方面得到改进，以满足更多专业人士的需求？

5.医生/护士希望在未来发挥作用

- 您希望在您当前的 EHR 系统中看到哪些附加特性或功能，以使其在您的实践中对您更有用？

感谢您接受我们的采访。 同时，非常感谢您对我们研究的帮助

补充采访领导层：

-您认为 EHR 系统的应用会对医院组织结构产生什么影响？

-您认为改变的好处是什么？

-您认为改变的缺点是什么？

Appendix 4: Interview Records

Table 4.2: Interviewee A1

A1
Sex: Male Position: Chief Physician Working time: 36 years

1. Me	How long have you been using traditional handwritten medical records?
2.A1	21 years
3.Me	How long have you been using an EHR system?
4.A1	15 years.
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?
6.A1	6 months.
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which

	system do you prefer?
8.A1	I am older, and I have formed a fixed habit of writing by hand for decades and only memorize the most important content. Before using electronic medical records, I seldom used computers, so the transition period from handwriting to electronic medical records was a bit long. The electronic version of the medical record has a fixed template, which is more comprehensive, but it takes too much time to fill in each item. Now that I am used to using computers, it is more convenient to use the electronic medical record system.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A1	The patient's previous visits can be retrieved, and various inspection results can be seen in the electronic medical record system more quickly.
11.Me	How do you feel to use the current EHR system?
12.A1	I am an old doctor. The hospital has changed three electronic medical record systems in the past fifteen years. Each system has a period of time to adapt. The current system can send critical value data to my mobile phone, no matter where I am , can be processed in time, greatly improving medical safety.
13.Me	Which main features do you find easy/difficult to use (why)?
14.A1	When writing medical records, you can copy and paste to improve the writing speed. You can see the patient's expenses in a timely manner, and communicate with the patient in time. Which feature is your favorite/least favorite: Copy-pasting is especially error-prone. Other people's medical information is sometimes mistakenly put in.

Table 4.2: Interviewee A2

A2	
Gender: Female Position: Doctor Working time: 2 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A2	No experience
3.Me	How long have you been using an EHR system?
4.A2	2 years
5.Me	How easy is it to use the current EHR system?
6.A2	Medium difficulty.
7.Me	Which main features do you find easy/difficult to use (why)?
8.A2	When I am on duty in the emergency department, I am in a hurry to write the medical records while dealing with the wound. If there is a wearable device, it would be great if I can automatically enter the electronic medical records when I ask.

9.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
10.A2	Basically. Fifty percent need to learn from each other in actual work with colleagues.
11.Me	If you think the training is insufficient, point out where the training is deficient.
12.A2	The training manual is too simple
13.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
14.A2	If there is a wearable device, it would be great if it can automatically enter the electronic medical record when I ask
15.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?
16.A2	I hope there is a reminder function similar to the step logic checklist. For example, you should prescribe various checklists first, and then prescribe medicine. Sometimes mistakes are made, and the EHR system can remind that there are steps that have been overlooked and forgotten
17.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
18.A2	Time logic performance reminder just fine. If there is a wearable voice or gesture interaction device, it can automatically enter the electronic medical record when I ask

Table 4.3: Interviewee A3

A3
Profession doctor
Sex: Male
Position: Deputy Chief Physician
16 years of working time

1.Me	How long have you been using traditional handwritten medical records?
2.A3	1 year
3.Me	How long have you been using an EHR system?
4.A3	15 years
5.Me	How long did it took to transition from traditional handwritten medical records to EHR system?
6.A3	1 month
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A3	The speed of handwriting medical records is slow, and it is impossible to access the medical records that were previously seen in our hospital. Of course, I prefer to use electronic medical records

9.Me	In what ways does your current EHR system improve the quality of care you provide to patients, and where is it being used more efficiently (and why)?
10.A3	It is no longer necessary to spend time looking through paper documents to access the medical records that were previously seen in our hospital.
11.Me	How easy is it to use the current EHR system?
12.A3	Our hospital has replaced three electronic medical record systems, which are of course more and more convenient and easy to use.
14.Me	Which main features do you find easy/difficult to use (why)?
15.A3	In the current electronic medical record system, there are historical records on the same interface, and the medical records of previous visits to the hospital can be retrieved.
16.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?

17.A3	Received training in the use of EHR systems. The training time is short, half a day. The training content covers a wide range, and more needs to be explored in the work.
18.Me	If you think the training is insufficient, point out where the training is deficient.
19.A3	The electronic medical record system needs more practical operation to find problems. It only needs someone who can answer and solve the problem in a timely manner in the first month of being online.
20.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
21.A3	Hope to have electronic aided diagnosis.
22.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
24.A30	It is hoped that the EHR systems of different hospitals have a unified database to see the medical records and medication status of patients in different hospitals

Table 4.4: Interviewee A4

A4	
Profession: doctor Gender: Female Position: Chief Physician Working time 38 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A4	23 years
3.Me	How long have you been using an EHR system?
4.A4	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?
6.A4	1 year
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?

8.A4	I did not know how to type before, and it's easier to use handwriting for decades. But the EHR system can provide a complete template to prevent missing many details. This allows the new doctor to quickly understand the condition when the patient changes primary care physicians
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A4	During the period of handwriting medical records, it is impossible to access the medical records that were previously seen in our hospital. I am an endocrinologist, and I can't use more or less medicine for diabetes. Being able to see the medical records I saw in our hospital before has greatly improved my work quality and efficiency
11.Me	How easy is it to use the current EHR system?
12.A4	Medium difficulty but always improving towards ease of use
13.Me	Which main features do you find easy/difficult to use (why)?
14.A4	During the period of handwriting medical records, it is impossible to access the medical records that were previously seen in our hospital. I am an endocrinologist, and I can't use more or less medicine for diabetes. I can see the medical records of my previous medical treatment in our hospital, which greatly improves the quality and efficiency of my work

15.Me	Which feature do you like/least like?
16.A4	I type slowly. It would be great if there is a wearable interactive device that can automatically enter the electronic medical record when I ask.
17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A4	Our hospital has replaced three electronic medical record systems, and has received training on the use of EHR systems each time
19.Me	If you believe the training is insufficient, please point out where the training was deficient?
20.A4	The electronic medical record system needs more practical operation to find problems. It only needs someone who can answer and solve the problem in a timely manner in the first month of being online.
21.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?

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22.A4	If there is a wearable device, it would be great if it can automatically enter the electronic medical record when I ask.
23.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?
24.A4	Review the patient's previous medical records in all hospitals.
25.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
26.A4	There is a card that can record the patient's previous medical records in all hospitals, which is convenient for doctors to read.

Table 4.5: Interviewee A5

A5	
Occupation: Doctor Gender: Female Position: Chief Physician Working time: 32 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A5	17 years
3.Me	How long have you been using an EHR system?
4.A5	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?
6.A5	six months

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7.Me	Comparing the EHR system with traditional handwritten records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A5	It has been handwritten for more than ten years and is relatively easy to use. There is a transition period from handwriting to electronic medical records. Electronic medical records can be copied and pasted, which can greatly reduce duplication of labour. Now that I am used to using computers, it is more convenient to use the electronic medical record system.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A5	The current system can send critical value data to my mobile phone in time. No matter where I am, I can deal with it in time
11.Me	How easy is it to use the current EHR system?
12.A5	Overall, it is more and more convenient and easy to use.
13.Me	Which main features do you find easy/difficult to use (why)?

14.A5	set of medical orders
	When a patient is determined to have a certain disease, the electronic medical record system can generate various medical orders and test check request form options to the doctor according to the clinical path, so that the doctor can choose and adjust according to the actual situation. Through the clinical knowledge base based on clinical pathways, it is possible to standardize physicians' diagnosis and treatment behaviours, fine-tune management of physicians, reduce medical expenses, and improve the efficiency of diagnosis and treatment.
15.Me	Which feature do you like/least like
16.A5	The medical record template has too much content and takes too much time to fill in.
17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A5	Our hospital has replaced three electronic medical record systems, and has received training on the use of EHR systems each time
19.Me	If you believe the training is insufficient, please point out where the training was deficient
20.A5	The training manual is too simple.

21.	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
22	If there is voice recognition, it would be great if I can automatically enter the electronic medical record when I ask
23	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
24	Review the patient's previous medical records in all hospitals
25	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)
26	The EHR database that can record the patient's previous visits to all hospitals is convenient for doctors to access

Table 4.6: Interviewee A6

A6	
Occupation Doctor Gender ：Female Position ：Physician Working time：3 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A6	0 years
3.Me	How long have you been using an EHR system?
4.A6	3 years
5.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?

6.A6	In clinical practice, most patients will take several drugs at the same time. Due to the interaction between drugs, when patients receive two drugs at the same time, drug toxicity may occur. Therefore, the rationality check of drug dosage, drug concentration, and route of administration is also an important function of clinical decision support. one. Great convenience for our young doctors.
7.Me	How easy is it to use the current EHR system?
8.A6	It is still very easy to get started.
9.Me	Which main features do you find easy/difficult to use (why)?
10.A6	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much. But when you go to the emergency department, it is also the most troublesome because the computer is running slowly and sometimes the computer will freeze. The speed of diagnosing patients is greatly reduced.
11.Me	Which feature do you like/least like

12.A6	A slow computer is my least favourite thing
13.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
14.A6	Received training in the use of EHR systems
15.Me	If you believe the training is insufficient, please point out where the training was deficient
16.A6	The training manual is too simple.
17.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
18.A6	Speed up computer.
19.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)

20.A6	Review the patient's previous medical records in all hospitals
21.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
22.A6	The patient has a card in his hand to record the medical records of all the hospitals before, which is convenient for doctors to read.

Table 4.7: Interviewee A7

A7	
Occupation: Doctor Sex: Male Position: chief physician Working time: 30 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A7	15 years
3.Me	How long have you been using an EHR system?
4.A7	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system.

6.A7	half a month
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A7	Handwriting is slower. I personally prefer electronics. The electronic medical record system is convenient and fast.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A7	When a doctor writes a doctor's order to a patient, the electronic medical record system will review the doctor's order or prescription according to the patient's drug allergy, and if any conflict is found, it will promptly warn the doctor and ask him to re-issue the doctor's order or prescription.
11.Me	How easy is it to use the current EHR system?
12.A7	Our hospital has replaced three electronic medical record systems. For me, it is generally more and more convenient and easy to use.
13.Me	Which main features do you find easy/difficult to use (why)?

14.A7	Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription, and prompt when there are inspection items or drugs that exceed the scope of the medical insurance catalogue. If there are items outside the scope of medical insurance, items within the scope of medical insurance are recommended for physician decision-making.
15.Me	Which feature do you like/least like?
16.A7	A slow computer is my least favourite thing
17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A7	Our hospital has replaced three electronic medical record systems, and has received training on the use of EHR systems each time. The training time is as short as half a day. The training content covers a wide range, and more needs to be explored in the work.
19.Me	If you think the training is insufficient, point out where the training is deficient.
20.A7	The electronic medical record system needs more practical operation to find problems.

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21.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
22.A7	If there is voice recognition, it would be great if I can automatically enter the electronic medical record when I ask
23.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
24.A7	Review the patient's previous medical records in all hospitals
25.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
26.A7	Speed up your computer. The introduction of more advanced electronic supporting products, such as voice recognition, electronic wearable devices, etc.

Table 4.8: Interviewee A8

A8	
Occupation: Doctor Gender: Female Position: Resident Physician Working time: 10 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A8	0 years
3.Me	How long have you been using an EHR system?
4.A8	10 years
5.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?

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6.A8	Handwriting is slow, and the electronic medical record system is convenient and fast.
7.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
8.A8	A set of doctor's orders, when the patient is determined to have a certain disease, the electronic medical record system can generate various doctor's orders and inspection and inspection application list options for the doctor according to the clinical path, so that the doctor can choose and adjust according to the actual situation. Through the clinical knowledge base based on clinical pathways, it is possible to standardize physicians' diagnosis and treatment behaviours, fine-tune management of physicians, reduce medical expenses, and improve the efficiency of diagnosis and treatment.
9.Me	How easy is it to use the current EHR system?
10.A8	For me, there is no difficulty
11.Me	Which main features do you find easy/difficult to use (why)?

12.A8	Order sets are great but have flaws. For example, the EHR system does not remind the manufacturer of the drug change in the doctor's order set, and it will only be discovered when the drug is not available.
13.Me	Which feature do you like/least like?
14.A8	A slow computer is my least favourite thing
15.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
16.A8	Received training in the use of EHR systems.
17.Me	If you think the training is insufficient, point out where the training is deficient.
18.A8	The training manual is too simple.
19.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)

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20.A8	The drug manufacturer system must be able to remind
21.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
22.A8	Computer systems are more autonomous. For example, if a certain drug is used up in our hospital, it should be able to jump out of similar products for us to use.
23.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
24.A8	Speed up your computer.

Table 4.9: Interviewee A9

A9	

profession doctor
 	
  Gender: Female
 	
  Position: attending physician
 	
Working time: 14 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A4	0 years
3.Me	How long have you been using an EHR system?
4.A4	14 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system. Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
6.A4	Handwriting is slow, and the electronic medical record system is convenient and fast.

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7.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
8.A4	When a doctor writes a doctor's order to a patient, the electronic medical record system will review the doctor's order or prescription according to the patient's drug allergy. If a conflict is found, a warning should be sent to the doctor in time to ask him to issue a doctor's order or prescription again.
9.Me	How easy is it to use the current EHR system?
10.A4	It is more and more convenient and easy to use.
11.Me	Which main features do you find easy/difficult to use (why)?

12.A4	Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription, and prompt when there are inspection items or drugs that exceed the scope of the medical insurance catalogue, if there is medical insurance For items outside the scope, items within the scope of medical insurance are recommended for physician decision-making.
13.Me	Which feature is your favourite/least favorite?
14.A4	A slow computer is my least favourite thing
15.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively? If you think the training is insufficient, point out where the training is deficient.
16.A4	Received training on the use of EHR system but the training time is short. The training content covers a wide range and more needs to be explored in the work. The electronic medical record system needs more practical operation to find problems.
17.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)

18.A4	If there is voice recognition, it would be great if I can automatically enter the electronic medical record when I ask
19.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
20.A4	Review the patient's previous medical records in all hospitals
21.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
22.A9	Speed up your computer. The introduction of more advanced electronic supporting products such as voice recognition, electronic wearable devices, etc.

Table 4.10: Interviewee A10

A10
profession doctor Sex: Male Position: attending physician Working time 10 years

1.Me	How long have you been using traditional handwritten medical records?
2.A10	0 years
3.Me	How long have you been using an EHR system?
4.A10	10 years
5.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?

6.A10	Handwriting is slower, and I personally prefer electronic products. The electronic medical record system is convenient and fast.
7.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
8.A10	Set of medical orders. When a patient is determined to have a certain disease, the electronic medical record system can generate various doctor's orders and test check request form options to the doctor according to the clinical path for the doctor to choose and adjust according to the actual situation.
9.Me	How easy is it to use the current EHR system?
10.A10	no difficulty
11.Me	Which main features do you find easy/difficult to use (why)?
12.A10	Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription, and prompt when any inspection items or drugs that exceed the scope of the medical insurance catalog are found. If there are items outside the scope of medical insurance, items within the scope of medical insurance are recommended for

	physician decision-making.
13.Me	Which feature do you like/least like?
14.A10	A slow computer is my least favorite thing
15.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively? If you think the training is insufficient, point out where the training is deficient.
16.A10	Received training in the use of EHR systems.Just need someone who can answer and solve the problem in a timely manner. The electronic medical record system needs more practical operation to find problems.
17.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
18.A10	It would be great if there is voice recognition that can automatically enter the electronic medical record when I ask

19.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
20.A10	Review the patient's previous medical records in all hospitals
21.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)
22.A10	Update your computer. Introduction of more advanced electronic supporting products

Table 4.11: Interviewee A11

A11
profession doctor Gender: Female Position: Deputy Chief Physician Working time: 23 years

1.Me	How long have you been using traditional handwritten medical records?
2.A11	8 years
3.Me	How long have you been using an EHR system?
4.A11	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?

6.A11	3 months
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A11	Handwriting is slow, and the electronic medical record system is convenient and fast.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A11	In clinical practice, most patients will take several drugs at the same time. Due to the interaction between drugs, patients may experience drug toxicity when receiving two drugs for treatment at the same time. The EHR system checks the rationality of drug dosage, drug concentration, route of administration, etc. to help me discover conflicting medical prescriptions in time.
11.Me	How easy is it to use the current EHR system?
12.A11	It is still very easy to get started.
13.Me	Which main features do you find easy/difficult to use (why)?

14.A11	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much, but it is also the most troublesome when I go to the emergency department because the computer runs slowly at this time. Greatly reduced the speed of seeing a doctor.
15.Me	Which feature do you like/least like
16.A11	A slow computer is my least favorite thing
17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A11	Received training in the use of EHR systems
19.Me	If you believe the training is insufficient, please point out where the training was deficient

20.A11	Our hospital has replaced three electronic medical record systems. I found that many functions of the electronic medical record system can be defined and created by myself. However, senior doctors have never used a computer when they were young, and most of them only use the most basic functions that have been set in the electronic medical record system when they use it at work, which is cumbersome and inflexible. It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help doctors make good use of the electronic medical record system
21.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
22.A11	It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help doctors make good use of the electronic medical record system
23.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
24.A11	Speed up your computer.
25.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)
26.A11	It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help doctors make good use of the electronic medical record system

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Table 4.12: Interviewee A12

A12
profession doctor Gender: Female Position: Deputy Chief Physician Working time: 20 years

1.Me	How long have you been using traditional handwritten medical records?
2.A12	5 years
3.Me	How long have you been using an EHR system?
4.A12	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?

6.A12	six months
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A12	Handwriting is slower and records less. The electronic medical record system is convenient and fast, and the recorded content is more comprehensive.
9.Me	How easy is it to use the current EHR system?
10.A12	generally
11.Me	Which main features do you find easy/difficult to use (why)?
12.A12	set of medical orders
13.Me	Which feature do you like/least like

14.A12	Order sets are great, but they have flaws. The drug replacement system in the doctor's order set cannot be reminded in time until the drug is not available.
15.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
16.A12	Our hospital has replaced three electronic medical record systems, and has received training on the use of EHR systems each time. Training time is short. The training content covers a wide range, and more needs to be explored in the work.
17.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
18.A12	Review the patient's previous medical records in all hospitals
19.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
20.A12	The patient has an electronic record card in his hand, which can record the medical records of all the hospitals before, which is convenient for doctors to read.

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Table 4.13: Interviewee A13

A13
Occupation: Doctor Gender: Female Position: Physician Working time: 2 years

1.Me	How long have you been using traditional handwritten medical records?
2.A13	0 years
3.Me	How long have you been using an EHR system?
4.A13	2 years
5.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?

6.A13	In clinical practice, most patients will take several drugs at the same time. Due to the interaction between drugs, when patients receive two drugs for treatment at the same time, drug toxicity may occur. Therefore, the dosage, concentration, and Rationality checks such as route of administration are also one of the important functions of clinical assistant decision support. Great convenience for our young doctors.
7.Me	How easy is it to use the current EHR system?
8.A13	very easy
9.Me	Which main features do you find easy/difficult to use (why)?
10.A13	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much.
11.Me	Which feature do you like/least like
12.A13	System slowness is my least favorite
13.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?

14.A13	Received training in the use of EHR systems
15.Me	If you believe the training is insufficient, please point out where the training was deficient
16.A13	The training manual is too simple.
17.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
18.A13	Speed up your computer.
19.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
20.A13	It is hoped that there will be more clinical auxiliary decision support, such as whether the diagnosis of the disease matches the drug pre-scribed by the doctor, whether the diagnosis of the disease is consistent with the record of the doctor's condition, etc., to remind doctors to re-duce errors.
21.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?

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22.A13	It is hoped that there will be more clinical auxiliary decision support. For example, whether the diagnosis of the disease and the medicine prescribed by the doctor match the diagnosis of the disease and whether the doctor's record of the condition is consistent, etc., to remind the doctor to reduce errors.

Table 4.14: Interviewee A14

A14
Occupation: Doctor Sex: Male   Position: chief physician Working time: 32 years

1.Me	How long have you been using traditional handwritten medical records?
2.A14	17 years
3.Me	How long have you been using an EHR system?
4.A14	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system.
6.A14	three months

7.Me	Comparing the EHR system with traditional handwritten records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A14	Handwriting is slow, and the content of the record is less. The electronic medical record system is convenient and fast, and the content of the record is more comprehensive.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A14	Set of medical orders.
11.Me	How easy is it to use the current EHR system?
12.A14	generally
13.Me	Which main features do you find easy/difficult to use (why)?
14.A14	set of medical orders

15.Me	Which feature do you like/least like?
16.A14	The copying and pasting of electronic medical record documents and copying phenomenon seriously over-rely on the copying and pasting function of the electronic medical record system. As a result, the writing form and content are the same, and even some content does not match the patient's condition. Electronic medical records bring convenience to clinical work and save a lot of time, but at the same time, electronic medical records are not conducive to the writing level of clinicians' medical records to a certain extent. The content of the medical records is almost the same, ignoring the judgments and differences in diagnosis and treatment opinions among different patients; in addition, there will be certain medical safety risks if the content of the medical records is incorrectly recorded. Once there is a medical dispute, the unrealistic content of the medical records will be at a disadvantage in the communication and handling of medical disputes.
17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A14	Received training in the use of the EHR system, if you believe the training is insufficient, please point out where the training is deficient

The training manual is too simple. But many problems must be discovered at work. |

19.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
20.A14	It is hoped that there will be more clinical auxiliary decision support, such as whether the diagnosis of the disease matches the drug prescribed by the doctor, whether the diagnosis of the disease is consistent with the record of the doctor's condition, etc., to remind doctors to reduce errors.
21.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?
22.A14	Review the patient's previous medical records in all hospitals
23.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
24.A14	The introduction of more advanced electronic supporting products, such as voice recognition, can automatically record dictated doctor's orders when rescuing patients. The electronic wearable device records the patient's vital signs and automatically enters the electronic medical record system wait.

Table 4.15: Interviewee A4

A15
Occupation: Doctor Gender: Female Position: Physician   Working time: 9 years

1.Me	How long have you been using traditional handwritten medical records?
2.A15	0 years
3.Me	How long have you been using an EHR system?
4.A15	9 years
5.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?

6.A15	When a doctor writes a doctor's order to a patient, the electronic medical record system will review the doctor's order or prescription according to the patient's drug allergy, and if any conflict is found, it will promptly warn the doctor and ask him to re-issue the doctor's order or prescription.
	I personally feel that it is still very easy to get started.
7.Me	Which main features do you find easy/difficult to use (why)?
8.A15	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much.
9.Me	Which feature do you like/least like?
10.A15	A slow computer is my least favorite thing
11.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
12.A15	Received training in the use of EHR systems

13.Me	If you believe the training is insufficient, please point out where the training was deficient
14.A15	The training manual is too simple.
15.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
16.A15	Speed up your computer.
17.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?
18.A15	The logic review and error prompt function of the intelligent medical record quality control system can reduce input errors and increase speed.
19.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?

20.A15	The patient's electronic medical record can record the medical history of previous visits in all hospitals, which is convenient for doctors to read.

Table 4.16: Interviewee A16

A16	
Occupation: Doctor Sex: Male Position: chief physician Working time 36 years	

1.Me	How long have you been using traditional handwritten medical records?
2.A16	21 years
3.Me	How long have you been using an EHR system?
4.A16	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?
6.A16	1 year

7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A16	Handwritten medical records are concise and clear, but the doctor's font is generally considered to be a bible. Outpatient and emergency patients keep it by themselves, and there is no problem of privacy leakage. However, they are often poorly preserved and cannot be found when needed later. The content of electronic medical records is more comprehensive and easy to read at any time, but it may leak privacy. But in general, electronic medical records are better to use.
9.Me	How easy is it to use the current EHR system?
10.A16	generally
11.Me	Which main features do you find easy/difficult to use (why)?
12.A16	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much. But the hardware requirements are high and the system response time is slow

13.Me	Which feature do you like/least like?
14.A16	A slow computer is my least favorite thing
15.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
16.A16	Received training in the use of EHR systems
17.Me	If you believe the training is insufficient, please point out where the training was deficient?
18.A16	The training manual is too simple. But many problems must be discovered at work.
19.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
20.A16	Speed up your system.

21.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?
22.A16	Review the patient's previous medical records in all hospitals
23.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
24.A16	The patient has a card in his hand to record the medical records of all the hospitals before, which is convenient for doctors to read. Adding the logic review and error prompt function of the intelligent medical record quality control system can reduce input errors and improve speed.

Table 4.17: Interviewee A17

A17
Occupation: Doctor Sex: Male Position: chief physician Working time: 20 years

1.Me	How long have you been using traditional handwritten medical records?
2.A17	5 years
3.Me	How long have you been using an EHR system?
4.A17	15 years
5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?

6.A17	half a month
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A17	I used to be a doctor and now I work in the medical service. Writing medical records by hand is slow (it usually takes 1 to 2 hours to write a complete medical record by hand, but it only takes a short ten minutes to write a medical record through the template provided by the electronic medical record). The hospital can only manage the medical records of the whole hospital through spot checks, and the management of medical records cannot be carried out comprehensively and effectively. Electronic medical records are reflected on the computers of superior doctors, directors, and medical administration departments through the hospital network. The name of the doctor's medicine, the dosage of the medicine, and the treatment process are all clear at a glance. The patient's disease changes, examination, treatment plan, etc. are monitored in real time, and he has also become a beneficiary virtually.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A17	When a difficult case occurs, the treating doctor can also ask the superior doctor or specialist doctor for consultation through the computer network system. Senior physicians or specialist physicians can provide consultation opinions in their own offices or at home to help treating physicians make treatment plans. The application of electronic medical records and computer information systems will greatly shorten the time and improve the quality of medical consultation. Information exchange between upper and lower hospitals can improve the medical level of primary hospitals

11.Me	How easy is it to use the current EHR system?
12.A17	Those who have graduated from medical school in the past two decades can use it directly.
13.Me	Which main features do you find easy/difficult to use (why)?
14.A17	1. It is more convenient to retrieve and use. 2. The transmission speed is fast, which is conducive to remote consultation. 3. It improves the management of medical administration. 4. It provides information for sudden, contagious, and multiple diseases. Provide information on sexual, infectious, and multiple sexually transmitted diseases. For example, during SARS, if we can extract the characteristics of atypical pneumonia from the medical records, we can get hints from these symptoms to find a treatment plan to save the patient's life and an effective way to prevent the spread of the disease.
15.Me	Which feature do you like/least like?
16.A17	A slow computer is my least favorite thing

17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A17	Received training in the use of EHR systems
19.Me	If you believe the training is insufficient, please point out where the training was deficient
20.A17	Our hospital has replaced three electronic medical record systems. I found that many functions of the electronic medical record system can be defined and created by myself. However, senior doctors have never used a computer when they were young, and most of them only use the most basic functions that have been set in the electronic medical record system when they use it at work, which is cumbersome and inflexible. It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help doctors make good use of the electronic medical record system
21.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
22.A17	It is hoped that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help doctors make good use of the electronic medical record system
23.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)

24.A17	Speed up your computer.
25.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)
26.A17	It is hoped that the electronic medical record system will establish a national total storage, and with the authorization of the patient, the patient's crotch record can be checked when necessary.

Table 4.18: Interviewee A18

A18
Occupation: Doctor
Gender: Female
Position: Physician
Working time: 29 years

1.Me	How long have you been using traditional handwritten medical records?
2.A18	14 years
3.Me	How long have you been using an EHR system?
4.A18	15 years

5.Me	How long it took to transition from traditional handwritten medical records to an EHR system?
6.A18	six months
7.Me	Comparing the EHR system with traditional handwritten medical records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
8.A18	The paper medical records are completely written by doctors by hand. The heavy paperwork will inevitably lead to "heavenly script", and nurses may make mistakes in execution. Electronic medical records are clear and orderly, convenient, and quick.
9.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?
10.A18	I work in the medical record room now. Although paper medical records have a unified home page, writing format, and medical document writing regulations, the writing is very random, and it is difficult to standardize the medical records written by different doctors. The implementation of electronic medical records is based on the standardization of medical terminology. The names of diseases, basic formats, medical terms, transmission methods, image compression, etc. of electronic medical records are formulated as unified rules, and uniform codes are established for various basic conditions in medical records, such as address codes, occupation codes, family codes, and medical facility codes Etc., forming regional and national standards, so that the writing of medical records can be standardized and normalized.

11.Me	How easy is it to use the current EHR system?
12.A18	generally
13.Me	Which main features do you find easy/difficult to use (why)?
14.A18	Anyone who has been to the medical record room to inquire about medical records knows that if you want to use the information of paper medical records, you must first find the hospital number of the patient through the search index, and then move the medical records to browse. When querying the medical records of multiple patients, Not only is the speed slow, but the labor intensity is high, and the information is not comprehensive enough. The unique data format and centralized storage are conducive to quick input, rapid retrieval and query, calling and processing various diagnosis and treatment information, providing a large amount of integrated data for clinical, teaching, and scientific research, which is conducive to the sharing and exchange of information resources, and is also a statistical analysis, hospital The management of comprehensive and reliable information greatly improves the utilization efficiency of medical records.
15.Me	Which feature do you like/least like?
16.A18	A slow computer is my least favorite thing

17.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
18.A18	Received training in the use of EHR systems
19.Me	If you believe the training is insufficient, please point out where the training was deficient
20.A18	The training manual is too simple. More to explore at work. Ask each other to learn.
21.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use? (ease of use)
22.A18	Speed up your system.
23.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
24.A18	Review the patient's previous medical records in all hospitals

25.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)
26.A18	The implementation of electronic medical records can be based on the premise of the standardization of medical terminology in the world. The names of diseases, basic formats, medical terms, transmission methods, and image compression of electronic medical records are formulated as unified rules. Establish unified codes, such as address codes, occupation codes, family codes, medical facility codes, etc., to form regional, national, and international standards, so that the writing of medical records can be standardized and normalized.

Table 4.19: Interviewee B19

B19
Occupation: Nurse Gender: Female Position: Chief Nurse Working time: 30 years

1.Me	How long have you been using traditional handwritten medical records?
2.B19	six months
3.Me	Comparing the EHR system with traditional handwritten records, what do you think are the advantages and disadvantages of each, and which system do you prefer?
4.B19	Paper medical records are completely handwritten by doctors, and the handwriting is illegible and difficult to read. Electronic medical records are clear and orderly, convenient, and quick.
5.Me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?

6.B19	Using the electronic medical record system, it is possible to record the electronic process of clinical execution of doctor's orders in the nursing process according to the completion rate of execution, the compliance rate of nursing assessment, the completion rate of graded nursing rounds, etc., and complete the monitoring and management of process quality.
7.Me	How easy is it to use the current EHR system?
8.B19	It's difficult when you first start using it. got used to it now
9.Me	Which main features do you find easy/difficult to use (why)?
10.B19	The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much.
11.Me	Which feature do you like/least like?
12.B19	System slowness is my least favorite

13.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
14.B19	Received training on the use of the EHR system, more to explore in the work. Ask each other to learn.
15.Me	If you believe the training is insufficient, please point out where the training was deficient
16.B19	The training manual is too simple.
17.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
18.B19	I hope that the engineers of the electronic medical record system can develop an electronic medical record system like chatGPT to help us make good use of the electronic medical record system
19.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals?

20.B19	It is hoped that there will be more clinical auxiliary decision support, such as whether the diagnosis of the disease matches the drug prescribed by the doctor, whether the diagnosis of the disease is consistent with the record of the doctor's condition, etc., to remind doctors to reduce errors.
21.Me	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice?
22.B19	(Introduction of more advanced electronic supporting products, such as voice recognition, automatic input of dictated doctor's orders when rescuing patients. Electronic wearable devices record patients' vital signs and automatically enter electronic medical record systems, etc.

Table 4.20: Interviewee B20

B20	
Occupation: Nurse Gender: Female Position: Nurse in Charge Working time: 12 years	

1.Me	How long have you been using traditional handwritten medical records?
2.B20	0 years
3.ME	How long have you been using an EHR system?
4.b20	12 years
5.me	In what ways does your current EHR system improve the quality of your patient delivery, and where is it being used more efficiently (and why)?

6.B20	A set of doctor's orders, when the patient is determined to have a certain disease, the electronic medical record system can generate various doctor's orders and inspection and inspection application list options for the doctor according to the clinical path, so that the doctor can choose and adjust according to the actual situation. Through the clinical knowledge base based on clinical pathways, it is possible to standardize physicians' diagnosis and treatment behaviors, fine-tune management of physicians, reduce medical expenses, and improve the efficiency of diagnosis and treatment.
7.Me	How easy is it to use the current EHR system?
8.B20	no difficulty
9.Me	Which main features do you find easy/difficult to use (why)?
10.B20	Nurses can know the patient's admission plan in advance on the electronic medical record system and make full preparations. It also provides a history of food allergy to drugs in the past, checks the rationality of drug dosage, drug concentration, and route of administration, and provides alarms to improve medical safety.
11.Me	Which feature do you like/least like?
12.B20	A slow computer is my least favorite thing

13.Me	Have you received training in the use of the EHR system? If there is training, is it sufficient to help you use the EHR system effectively?
14.B20	I Received training in the use of EHR systems.The training manual is too simple. Many problems must be discovered at work.
15.Me	Where do you think the current EHR system can be improved to be more user-friendly and easy to use?
16.B20	Speed up your computer.
17.Me	Where do you think the EHR system can be advanced to meet the needs of more professionals? (professional)
18.B20	Review the patient's previous medical records in all hospitals
19.ME	What additional features or functionality would you like to see in your current EHR system to make it more useful to you in your practice? (comprehensive, free play)

19.B20	The patient has a card in his hand to record the medical records of all the hospitals before, which is convenient for doctors to read.
	Adding the logic review and error prompt function of the intelligent medical record quality control system can reduce input errors and improve speed.

Table 4.21: Interviewee L1

L1	
Occupation: Doctor Gender: Female Position: Department Director Working time: 23 years	
1.Me	What impact do you think the application of EHR systems will have on hospital organizational structure?
2.L1	The hospital has established a department dedicated to handling electronic information. The positions originally responsible for managing records in various medical departments were abolished and transferred to the newly established Information Office.
3.ME	What do you think are the benefits of change?
4.L1	Young doctors can focus more on improving their medical skills instead of being busy with paperwork. For the hospital, it increases the workforce for effective work. Reduced overall work stress. You know that China has a very large population and everyone wants the best medical resources. This puts a very heavy load on a top hospital like ours
5.me	What do you think are the disadvantages of change?

6.L1	For experienced doctors who have never been exposed to computer systems, it takes a long time to adapt. There will be some technical and management confusion during the initial application of EHR. Moreover, the EHR system is updated very quickly, and everyone has to constantly learn new relevant knowledge.

Table 4.22: Interviewee L2

L2	
Occupation: Doctor Gender: Female Position: Associate dean Working time: 20 years	
1.Me	What impact do you think the application of EHR systems will have on hospital organizational structure?
2.L2	The Archives Department has been cancelled. It was replaced by the Information Department. The personnel originally responsible for keeping files in each department have also been eliminated.
3.ME	What do you think are the benefits of change?
4.L2	We are subject to compliance inspections by our superior authorities every year. Before the EHR system is applied, it usually takes more than a week to check and verify the files. Now it only takes a day to complete. We also gain real-time and deeper insights into hospital staff. In the past, due to the time and cost relationship, we were informed based on reports from employee supervisors. Now you can use the EHR system to retrieve employee data for more objective and comprehensive evaluations.
5.me	What do you think are the disadvantages of change?

6.L2	Hospital employees need higher cultural and technical literacy to cope with digitalization. Our threshold for recruiting new employees has been much higher than before. It also increases overall labour costs.

Table 4.23: Interviewee L3

L3	
Occupation: Doctor Gender: Male Position: Associate dean Working time: 27 years	
1.Me	What impact do you think the application of EHR systems will have on hospital organizational structure?
2.L3	The Archives Department has been cancelled. It was replaced by the Information Department. Now junior employees can also communicate directly with senior leaders. The hospital has adopted flatter management.
3.ME	What do you think are the benefits of change?
4.L3	Doctors no longer have to deal with many things unrelated to medicine, and their work efficiency has been greatly improved. And the threshold for cross-department cooperation and communication has been greatly reduced. In the past, cross-departmental cooperation was only possible for serious illnesses or complex medical problems. Now doctors only need to

	sit in the office and communicate across departments through the EHR system. There is no need to repeatedly print materials and constantly hold meetings to check progress.
5.me	What do you think are the disadvantages of change?
6.L3	Everyone needs to learn to use an EHR system. A small number of people will encounter difficulties when learning. Sometimes after the system is updated, bugs may be encountered, causing the system to become unusable and delay work.

Appendix 5: Follow-up Interview

Occupation: Doctor

Name: Confidential according to the doctor's request

Sex: Confidential according to the doctor's request

Position: Confidential according to the doctor's request

Working time: Confidential according to the doctor's request

Q: How do you see the conflict between your experience and Huawei's statement?

A: As the EHR system needs to extract data from existing hospital systems such as the Hospital Information System (HIS), Laboratory Information System (LIS), and Picture Archiving and Communication System (PACS). The process of mapping fields between the EHR and these systems is complex and time-consuming. Sometimes, the required fields in the EHR do not correspond directly to fields in the other systems, requiring extensive search and consultation with the staff responsible for the respective systems. In some cases, the vendors of the other systems are uncooperative, especially if their products were not chosen for the new EHR system. They may even demand additional payment to cooperate, further complicating the process.

Q: How does this issue influence the routine use of the EHR system?

A: It's causing hospital staff, particularly when it comes to maintaining various medical record templates, to be resistant to using the EHR. The previous EHR system used document-style record writing, but the new national EHR system rating requires as much record formatting as possible to facilitate data collection. This change is not user-friendly for the staff maintaining the templates, as it requires more than just copy-pasting. The new EHR system requires the insertion of input fields for elements such as date, chief complaint, symptoms, and signatures. This has led to a lack of cooperation from the staff, who attend training sessions without the intention to learn. The author also mentions a systemic issue where no department takes responsibility for maintaining the templates, leading to a runaround between different departments.

Appendix 6: Summary of Respondent Detail

Table 6.1 Summary of Respondent Detail

Respondents	Country	Position	Seniority(Years)
A1	China	Chief Physician	36
A2	China	Physician	2
A3	China	Deputy Chief Physician	16
A4	China	Chief Physician	38
A5	China	Chief Physician	32
A6	China	Physician	3
A7	China	Chief physician	30
A8	China	Resident Physician	10
A9	China	Attending physician	14
A10	China	Attending physician	10
A11	China	Deputy Chief Physician	23
A12	China	Deputy Chief Physician	20
A13	China	Physician	2
A14	China	Chief physician	32
A15	China	Physician	9
A16	China	Chief physician	36
A17	China	Chief physician	20
A18	China	Physician	29
B19	China	Chief Nurse	30
B20	China	Chief nurse	12

6.3.1.1.1

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Respondents	Country	Position	Seniority (Years)
L1	China	Department Director	23
L2	China	Associate dean	20
L3	China	Associate dean	27

Appendix 7: Examples of open coding

Table 7.1: Open coding

Interview materials	Initial conceptual-ization	Conceptualization	Categorization
Handwritten medical records are concise and clear	Handwritten medical records are concise and clear	Be concise and clear	Simplicity
Outpatient and emergency patients keep it by themselves, and there is no problem of privacy leakage.	Handwritten medical records are highly privacy-protective	High privacy protection	Privacy
The World Health Organization recently announced a statistic: 6% of patients received wrong treatment, and doctors' handwriting was illegible. Making mistakes by nurses and patients is the main reason. Electronic medical records minimise the incidence of such errors	The doctor's font is not easy to understand, which is easy to cause wrong treatment	Font misunderstanding	fatalness
I work in the medical record room now. Although paper medical records have a unified home page, writing format, and medical document writing regula-	Handwritten medical records are difficult to standardise	Poor standardisation	Hybridity

tions, the writing is very random, and it is difficult to standardise the medical records written by different doctors			
Anyone who has been to the medical record room to inquire about medical records knows that if you want to use the information of paper medical records, you must first find the hospital number of the patient through the search index, and then move the medical records to browse. When querying the medical records of multiple patients, Not only is the speed slow, but the labour intensity is high, and the information is not comprehensive enough	The query of medical records is slow, labour-intensive, and the information is not comprehensive enough	The inquiry is time-consuming and laborious	Time-consuming
Writing medical records by hand is slow (it usually takes 1 to 2 hours to write a complete medical record by hand)	Handwriting is slower, takes longer, and records less	Handwriting is inefficient	
It takes a lot of time to flip through the same patient file	It takes a lot of time to flip through the same patient file	Time consuming to flip through archives	

The hospital can only manage the medical records of the whole hospital through spot checks, and the management of medical records cannot be carried out comprehensively and effectively.	Comprehensive and effective management of medical records is not possible	Incomplete management of medical records	limitations
They are often poorly preserved and cannot be found when needed later	Handwritten medical records are easy to drop and poorly preserved	Poor preservation	instability
During the period of handwriting medical records, it is impossible to access the medical records that were previously seen in our hospital.	One-time medical records	disposable	
Electronic medical records minimise the incidence of such errors.	Minimise the chance of incorrect treatment due to difficult handwriting by doctors	Reduce the probability of misdiagnosis of handwriting	security
When a difficult case occurs, the treating doctor can also ask the superior doctor or specialist doctor for consultation through the computer network system. Senior physicians or specialist	Facilitate the exchange of information between upper and lower level hospitals and improve the medical level of grassroots hospitals	Barrier-free exchange of information	Convenience

physicians can provide consultation opinions in their own offices or at home to help treating physicians make treatment plans. The application of electronic medical records and computer information systems will greatly shorten the time and improve the quality of medical consultation. Information exchange between upper and lower hospitals can improve the medical level of primary hospitals			
Electronic medical records can be copied and pasted, which can greatly reduce duplication of labour	Copy and paste medical record templates to reduce duplication of effort.	Templating of medical records	
It improves the management of medical administration. It is more convenient to retrieve and use.	Improve medical administration	Simplified administration	
It is more convenient to retrieve and use	More convenient retrieval and use	Ease of use of search	

electronic medical records is more comprehensive and easy to read at any time	Read anytime, anywhere	Read anytime, anywhere	
In the current electronic medical record system, there are historical records on the same interface, and the medical records of previous visits to the hospital can be retrieved.	Establish permanent electronic files for patients in the same hospital to facilitate viewing results and improve work efficiency	Patient files are permanent	
The rationality check of drug dosage, drug concentration, route of administration, etc. is a function of electronic medical records that I like very much.	Rationality to check drug dose, drug concentration, route of administration, etc	Rationalisation of drug dose, concentration, and route	Rationality
When a doctor writes a doctor's order to a patient, the electronic medical record system will review the doctor's order or prescription according to the patient's drug allergy. If a conflict is found, a warning should be sent to the doctor in time to ask him to issue a doctor's order	Review doctor's orders or prescriptions according to the patient's drug allergy and stop the conflict situation in time	Review of medical orders or prescriptions based on allergens	Timeliness

or prescription again.			
You can see the patient's expenses in a timely manner, and communicate with the patient in time	Check patient fees in time and communicate with patients in a timely manner	Stay up to date with patient fees	
Each system has a period of time to adapt. The current system can send critical value data to my mobile phone, no matter where I am , can be processed in time, greatly improving medical safety.	Timely processing of critical value data significantly improves medical safety	Timely processing of critical value data	
Nurses can know the patient's admission plan in advance on the electronic medical record system and make full preparations.	Know your patient's admission plan in advance and be well prepared	Know your patient's admission plan in advance	
The electronic version of the medical record has a fixed template, which is more comprehensive.	Comprehensive medical record templates	Medical record template types are comprehensive	Reliable comprehensiveness

Hospital The management of comprehensive and reliable information greatly improves the utilisation efficiency of medical records.	The electronic medical record information is reliable and comprehensive, which significantly improves the utilisation efficiency of medical records	Medical record information is reliable and comprehensive	
Electronic medical records are clear and orderly.	Electronic medical records are clear and organised	Ordered set of medical records	Orderliness
The transmission speed is fast, which is conducive to remote consultation.	Fast transmission speed, conducive to remote consultation	Fast transfer of medical records	
But it only takes a short ten minutes to write a medical record through the template provided by the electronic medical record.	The short time to record medical records (ten minutes) is conducive to focusing on the diagnosis and treatment of patients	The time required for medical record recording is short	Speediness
The unique data format and centralised storage are conducive to quick input, rapid retrieval, and query, calling and processing various diagnosis and treatment information.	Quickly enter, retrieve, query, recall and process electronic medical record data to improve the quality of medical consultations	Quick access to electronic medical records	

It provides information for sudden, contagious, and multiple diseases. Provide information on sexual, infectious, and multiple sexually trans-mitted diseases. For ex-ample, during SARS, if we can extract the charac-teristics of atypical pneu-monia from the medical records, we can get hints from these symptoms to find a treatment plan to save the patient's life and an effective way to pre-vent the spread of the dis-ease.	Provides infor-mation on sudden, contagious and multi-disease dis-eases to find life-saving treatment options and effec-tive ways to pre-vent the spread of disease	Provide disease knowledge	
the completion rate of graded nursing rounds, etc., and complete the monitoring and manage-ment of process quality.	Record the nursing process, electronic process of clinical execution, monitor and manage the quality of the pro-cess	Monitor and man-age process quali-ty	Real-time
The patient's disease changes, examination, treatment plan, etc. are monitored in real time, and he has also become a	Real-time monitor-ing of patient changes, examina-tion conditions, treatment plans, etc	Monitor patient visits in real time	

beneficiary virtually.			
providing a large amount of integrated data for clinical, teaching, and scientific research.	Provide a large number of clinical, teaching, and scientific research integration data	Provide a lot of data	Data informatization
which is conducive to the sharing and exchange of information resources, and is also a statistical analysis.	It is conducive to the sharing and exchange of information resources and facilitates statistical analysis	Facilitate data contribution and statistical analysis	
there will be certain medical safety risks if the content of the medical records is incorrectly recorded. Once there is a medical dispute, the unrealistic content of the medical records will be at a disadvantage in the communication and handling of medical disputes.	Medical safety risks with incorrect medical records	Medical security risks	fatalness
but at the same time, electronic medical records are not conducive to the writing level of clinicians' medical records to a certain extent. The content of the medical records is	Electronic medical records are somewhat detrimental to the level of writing of clinicians' medical records. The contents of the	Ignore patient variability	

almost the same, ignoring the judgments and differences in diagnosis and treatment opinions among different patients	medical records are similar, ignoring the differences in judgement and diagnosis and treatment opinions between different patients		
Copy-pasting is especially error-prone. Other people's medical information is sometimes mistakenly put in.	It is easy to misplace other people's medical information, and it is easy to make mistakes in copying and pasting templates	Misplacing someone else's medical information	
but there are defects. The medicines in the set of doctor's orders have changed manufacturers, and the computer will not remind you, and you will only find out when you cannot get the medicines.	The prescription system cannot alert you in time that the number of drugs is about to reach zero	The dressing change system reminder is not timely	
but it may leak privacy.	Risk of privacy leakage	Privacy breaches	
But when you go to the emergency department, it is also the most troublesome because the computer is running slowly and sometimes the computer will freeze. The speed of diagnosing pa-	High hardware requirements and slow system response times reduce the rate of patient diagnosis	Slow system response time	Time-consuming

tients is greatly reduced.			
Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription,	Provide a knowledge base to automatically review medical orders or prescriptions	Automatically review doctor's orders or prescriptions	
Provide a medical insurance knowledge base, that is, when a doctor writes a doctor's order or prescription, the knowledge base can automatically review the doctor's order or prescription, and prompt when any inspection items or drugs that exceed the scope of the medical insurance catalogue are found. If there are items outside the scope of medical insurance, items within the scope of medical insurance are recommended for physician decision-making.	Prompt the examination items or drugs that are beyond the scope of the medical insurance catalogue, and recommend the items covered by the medical insurance	Recommended items covered by medical insurance	Intelligence

Time logic performance reminder just fine.	Reminder time logic		
Computer systems are more autonomous. For example, if a certain drug is used up in our hospital, it should be able to jump out of similar products for us to use.	The system autonomously and automatically selects similar drugs and replaces the used drugs	Replace used drugs on their own	
The medicine in the doctor's order is changed from another manufacturer. The computer will not remind you, and you will only find out when you cannot get the medicine. Hope to remind the doctor when prescribing a set of medical orders	Drug manufacturers systematically remind them of drug stocks in a timely manner	Timely reminder of drug stocks	
It is hoped that there will be more clinical auxiliary decision support, such as whether the diagnosis of the disease matches the drug prescribed by the doctor, whether the diagnosis of the disease is consistent with the record of the	Increase electronic-assisted diagnosis (development of an electronic medical record system similar to chatgpt,) to assist in the better use of electronic medical record systems	Add electronically assisted diagnostics	

doctor's condition, etc., to remind doctors to reduce errors.			
The introduction of more advanced electronic supporting products, such as voice recognition, can automatically record dictated doctor's orders when rescuing patients. The electronic wearable device records the patient's vital signs and automatically enters the electronic medical record system	Add wearables, voice recognition or gesture interaction devices to automatically enter electronic medical records	Add automatic entry of electronic medical record equipment	
The logic review and error prompt function of the intelligent medical record quality control system can reduce input errors and increase speed.	Add logical review and error and ignore step hints to the intelligent medical record quality control system to reduce input errors and increase speed.	Added intelligent medical record quality check	
Speed up your computer.	Accelerate computers or launch more advanced electronic companion products	Speed up your computer	System speed

The patient's electronic medical record can record the medical history of previous visits in all hospitals, which is convenient for doctors to read.	Add the function of viewing the medical records of all hospitals or make a national hospital card	Electronic medical records are accepted nationwide	Coverage
The implementation of electronic medical records can be based on the premise of the standardisation of medical terminology in the world. The names of diseases, basic formats, medical terms, transmission methods, and image compression of electronic medical records are formulated as unified rules. Establish unified codes, such as address codes, occupation codes, family codes, medical facility codes, etc., to form regional, national, and international standards, so that the writing of medical records can be standardised and normalised.	Establish national and international electronic medical record standards to promote the standardisation and standardisation of medical records	Standardisation of electronic medical records	standardisation
The training manual is too simple. But many problems must be discovered at work.	Enrich the content of the training manual	Training manuals	training

Received training in the use of EHR systems. The training time is short, half a day. The training content covers a wide range	Increase EHR system training time	Training time	

Appendix 8: Main categories and corresponding scope connotations

Table 8.1: Main Categories and corresponding Connotations

Main category	Corresponding category	Scope connotation
Advantages of EHR system	Security	Protection of systems or components against accidental or intentional access, use, modification, destruction, or disclosure
	Convenience	Give convenience
	Rationality	Refers to reasonableness or reasonableness
	Timeliness	Seize the moment and seize the time
	Reliability	The ability of products and systems to complete specified functions under specified conditions and within specified time
	Orderliness	When the constituent elements of a thing have some constraint and present a certain law, the thing or system is said to be orderly

	Speediness	Refers to fast, convenient, generally described as fast and high-speed work efficiency or information
	Normative	It refers to the establishment and operation of an enterprise from the preparation and operation to the separation and merger, from the material supply, manufacturing to product sales in operation, each link, each step, each process, each position, there are certain rules and standards.
	Real-time	Synchronising (doing something) at the actual time when something happens and develops
	Data informatization	Based on modern communication, network,
Disadvantages of EHR system	Fatalness	Refers to the expected frequency of adverse effects when exposed to a certain contaminant
	Time-consuming	Time-consuming

Main category	Corresponding category	Scope connotation
Advantages of traditional hand-written medical records	Privacy	Information that is not publicly available
	Simplicity	Concise content requires the use of methods such as condensing and summarising, reducing the whole to zero, and breaking the text to reflect simplicity and clarity
Disadvantages of traditional hand-written medical records	Fatalness	Refers to the expected frequency of adverse effects when exposed to a certain contaminant
	Time-consuming	Time-consuming
	Hybridity	chaos, mixing; doping
	Limitations	An object or person has certain deficiencies, and this deficiency can be artificial or natural, similar to the insurmountable of a rule. Due to limitations, it often makes it difficult to complete a thing
	Instability	Stability and instability are the properties of material systems that maintain and change a certain state over the

		course of time

Main category	Corresponding category	Scope connotation
EHR system future improvements finding	Intelligence	The sum of knowledge and intelligence, the former is the basis of intelligence, and the latter refers to the ability to acquire and apply knowledge to solve
	System speed	The system responds quickly
	Coverage	One measure of test completeness is a measure of test effectiveness
	Standardisation	Uniform provisions for repetitive matters and concepts, based on the results of a combination of scientific and technological and practical experience, are approved by the competent bodies by consensus and issued in a specific form as guidelines and basis for common observance