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Implementation of Electronic Health Records (EHR) In an Interprofessional Collaboration Model of Care to Improve Patient Outcomes: A Systematic Literature Review

تنفيذ السجلات الصحية الإلكترونية **(EHR)** في نموذج تعاوني بين المهنيين للرعاية لتحسين نتائج المريض: مراجعة منهجية للأدبيات

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ملخص

الملخص

تهدف هذه الورقة العلمية الى تحسين نتائج المرضى بسبب تعزيز مشاركة المعلومات والتنسيق ووضع خطط رعاية شاملة. يعمل دمج السجلات الصحية الإلكترونية (EHRs) في نموذج الرعاية التعاونية بين التخصصات على تسهيل التنسيق والتعاون واتخاذ القرارات المشتركة ، مما يؤدي إلى رعاية عالية القيمة وتحسين النتائج الصحية. لذلك ، تستكشف هذه الدراسة العلاقة بين السجلات الصحية الإلكترونية في الممارسة التعاونية ونتائج المرضى.

الكلمات المفتاحية: السجلات الصحية الإلكترونية ، السجلات الصحية الإلكترونية ، التعاون بين المهنيين ، الرعاية التعاونية ، الفرق متعددة التخصصات ، ونتائج المرضى.

Abstract

Abstract

. This paper helps improve patient outcomes due to the enhanced information sharing, coordination, and establishment of comprehensive care plans. Integrating electronic health records (EHRs) into the interprofessional collaboration care model facilitates coordination, collaboration, and shared decision-making, leading to high-value care and improving health outcomes. Therefore, this study explores the correlation between EHRs within collaborative practice and patient outcomes

Keywords: E*lectronic health records, EHRs, interprofessional collaboration, collaborative care, multidisciplinary teams, and patient outcomes..*

Introduction

Interprofessional collaboration in healthcare involves cooperation among healthcare personnel to ensure the well-functioning of the organization. It also improves patient outcomes since an interprofessional collaboration model supports patient-centered and evidence-based care. Research often describes the interprofessional collaboration as the performance of two or more practitioners within a system that enables them to conduct interdependent tasks under a negotiated agreement that values the contribution and expertise of each personnel [1]. Most patients in contemporary healthcare facilities, especially those with chronic diseases, have complex symptoms that require professionals with varying skills and knowledge to collaborate throughout the care delivery process. Therefore, the primary objective of interprofessional collaboration is to establish a multi-perspective framework that allows healthcare practitioners to share power, goals, knowledge, skills, and decision-making to improve the quality of care [2]. The collaborative model requires the involved professionals to understand and respect each other's roles and expertise to ensure effective functioning. As a result, it is often associated with positive outcomes, including high personnel job satisfaction, work engagement, and patient safety and health outcomes.

Electronic health records (EHRs) are implemented within the interprofessional collaboration model to facilitate coordination, collaboration, and shared decision-making to deliver high-value care. Patients under the interprofessional collaboration model move through a care trajectory, meeting different practitioners depending on their needs [1]. For instance, a patient with a chronic disease may encounter a nurse practitioner or physician for chronic disease management, a nutritionist for diet advice, and a pharmacist on medication instructions during a single visit. In such a case, EHR plays a critical role in ensuring a seamless flow of patient data

from one provider to the other. In addition, the system allows digital documentation and storage of the patient visit to ensure the accuracy and availability of data for use during the subsequent patient encounter [2]. As a result, EHR contains heterogeneous patient data that includes diagnoses, demographic data, medications, laboratory test results, medical images, and clinical notes that aid the continuous delivery of quality care [3]. In addition, the information sharing aspect of EHR improves interprofessional communication, which is essential for the efficient and effective functioning of a healthcare facility and improving patient outcomes. A major positive result of this EHR-based collaboration is that it helps build relationships among healthcare practitioners as they share insights and views on patient care.

Integrating EHRs in the interprofessional collaboration model enhances multiple patient outcomes by increasing efficiency in today's complex patient care. For instance, it reduces readmission and hospitalization rates, lowers hospitalization time and costs, and improves healthcare quality [4]. Interprofessional collaboration is also associated with enhanced patient satisfaction, reduced medical errors, and improved healthcare for patients with chronic diseases. A 2019 research elaborated on the connection between these patient outcomes and the interprofessional collaboration model by arguing that integrating interdisciplinary cooperation within healthcare is a crucial component of the reforms needed to address rising healthcare costs, population health, and patient satisfaction concerns [5]. These improved outcomes are often associated with the combination of different practitioners' insights, knowledge, and expertise during interprofessional collaborative care and practice. However, some research indicates that integrating EHR in an interprofessional team is associated with a certain level of complexity and challenges that can potentially undermine practitioners' performance and, consequently, patient outcomes. For instance, a 2020 research by Vos et al. noted that EHRs affect collaboration in

multiple ways, including workflow mismatches, paper persistence, alert fatigue, and time consuming [6]. The study further argues that the time taken with the EHR system reduces the time spent on face-to-face interactions with patients. These issues can significantly negatively impact patient satisfaction and the quality of care delivered. These findings indicate that implementing EHRs into the interprofessional collaboration model in healthcare can negatively or positively impact practitioners and patients. This systematic review, therefore, aims to conduct an in-depth analysis of the impact of EHRs in collaborative practice on patient outcomes.

Methodology

A systematic literature review was conducted to gather and synthesize data on integrating EHRs into interprofessional collaborative care and its impact on patient outcomes. This methodology was based on its recognition as a rigorous research methodology used to aggregate, interpret, explain, and integrate existing research to produce quality, reproducible research findings [7]. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Eligibility Criteria

The search sought to identify studies that considered the impact of integrating EHRs in interprofessional collaborative care on patient outcomes. Although any study type was permitted, the studies selected for this review had to meet the following criteria;

i). The articles had to be peer-reviewed and provide a clear description of their methods

ii). Focus on EHRs, and interprofessional collaborative care and show impact on selected patient outcomes

iii). Be published between 2017 and 2022

iv). Be published English

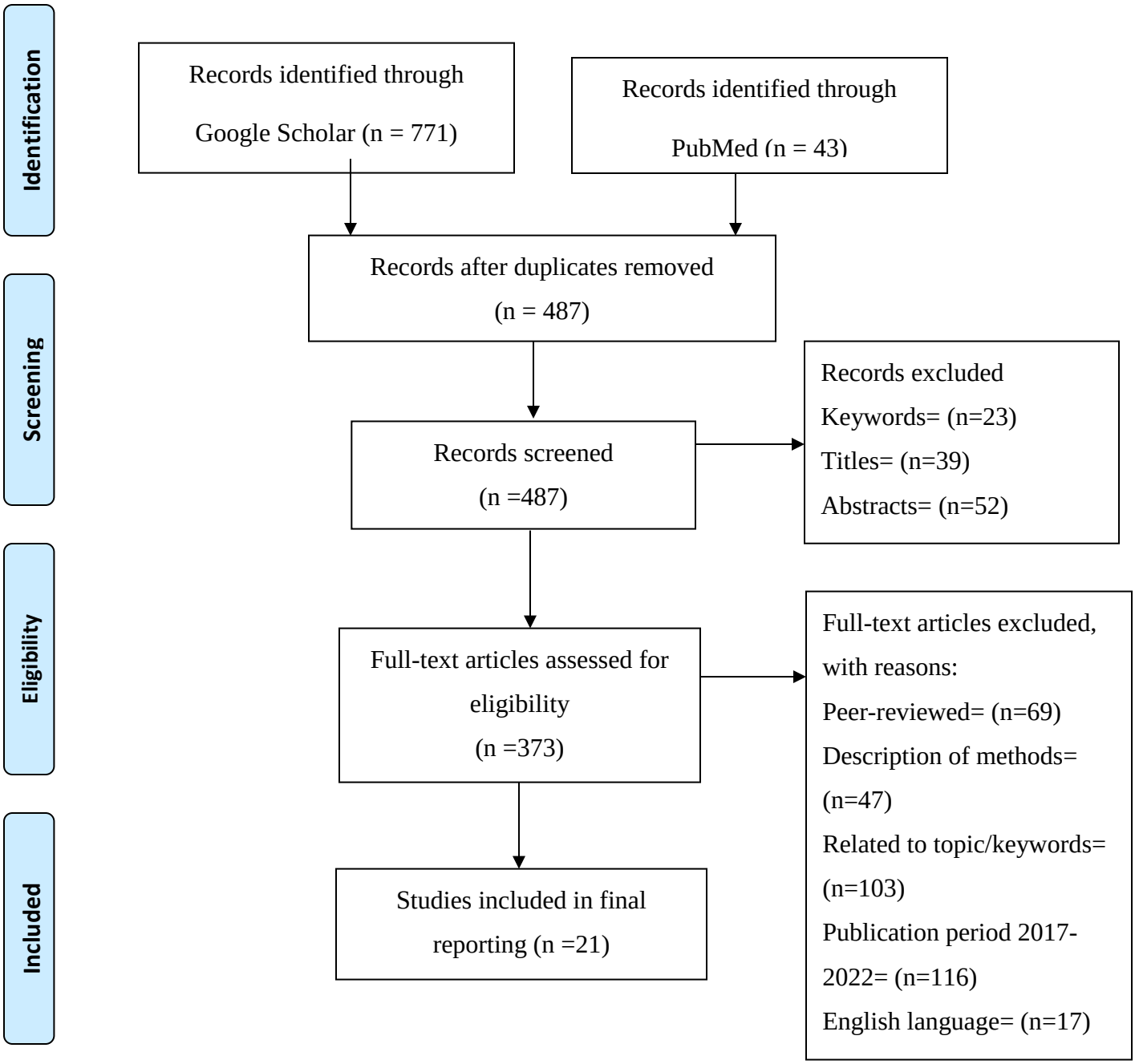
Search Strategy

Google Scholar and PubMed databases were used to search and select relevant studies for the report. These databases were chosen for their popularity as the most comprehensive databases for health-related systematic review searches. For instance, Google Scholar provides access to free online resources and allows the researcher to locate articles within multiple databases, including links to ECU Libraries. The initial search terms used were *electronic health records, EHRs, interprofessional collaboration, multidisciplinary teams, and collaborative care,* with the exact keyword *patient outcomes.* Various filters were applied, such as publication period 2017-2022, peer-reviewed, and English language, to limit the search results to the most relevant articles.

Study Selection

Firstly, the retrieved records were screened based on keywords, titles, and abstracts and excluded if; i) they did not focus on EHRs and interprofessional collaboration, ii) it wasn't clear from the abstract if they included any patient outcomes, iii) they were not in English iv) they were published before 2017 v) they were not peer-reviewed v) they did not include methods. Secondly, a full-text screening was conducted to select the articles for the final reporting. The records were excluded if they did not meet the inclusion criteria. The researcher conducted the search strategy and study selection; no other reviewers were involved. Following this literature search process, a total of 21 documents were selected for the final reporting, as summarized in Figure 1 below.

Figure 1: PRISMA flow diagram for systematic reviews



Results

Search Results

Although numerous kinds of research have been done on EHRs and the significance of interprofessional collaboration, most existing literature focuses on the impact on healthcare professionals. Sources that assessed patient outcomes either focused on interprofessional collaboration or EHRs but not both simultaneously. As a result, there is limited research focusing on patient outcomes regarding integrating EHRs in interprofessional collaborative care. However, the initial search identified 771 documents, but only 21 (Figure 1) met the eligibility and inclusion criteria for final analysis and syntheses. Table 1 summarizes the characteristics of individual studies, highlighting the specific patient outcomes measured and conclusions made in each study.

Author(s)	Article Title	Patient outcomes measured	Conclusions
Aboueid et al. (2019)	Dietitians' perspectives on the impact of multidisciplinary teams and electronic medical records on dietetic practice for weight management. Canadian Journal of Dietetic Practice and Research, 81(1), 2-7. https://doi.org/10.3148/cjdpr-2019-015	- Improved weight management - Quality of care	- The study found that multidisciplinary settings with integrated EHRs facilitated collaboration that led to improved dietician practices for weight management - Conclusions were based on convenient scheduling, consistent messaging, and ongoing support under these settings
Hekman et al. (2022)	Exploration of the patient and caregiver cancer education using electronic health records. Journal of Geriatric Oncology, 13(1), 108-110. https://doi.org/10.1016/j.jgo.2021.06.008	- Readmission - Quality of life - Mental health	- Although nurses are more responsible for patient education, including caregivers through an interprofessional collaboration care model can improve patient outcomes
Beckmann	Electronic patient record and its	- Patient safety	- Availability of real-time

et al. (2021)	effects on social aspects of interprofessional collaboration and clinical workflows in hospitals (eCoCo): a mixed methods study protocol. BMC Health Services Research, 21(1), 1-10. https://doi.org/10.1186/s12913-021-06377-5	- Quality of care	patient data and access to information improves the overall quality of healthcare services - The documentation and communication through EHRs reduce medical and billing errors, improving patient safety
Guck et al. (2019)	Improved outcomes associated with interprofessional collaborative practice. Annals of family medicine, 17(S1), S82-S82. https://doi.org/10.1370/afm.2428	- Hemoglobin A_{1c} levels - cost of care - hospitalizations - emergency department visits	The study establishes that interprofessional collaborative practice (IPCP) is associated with reductions of; - 16.7% of emergency department visits - 17.7% in hospitalizations - 0.8% in hemoglobin A_{1c} levels - 48.2% of total patient charges
Dello et al. (2021)	A nurse-led multicomponent intervention supported by advanced electronic health records to improve the acute management of stroke patients: A pre-and post-intervention study. International Journal of Nursing Studies Advances, 3,100023. https://doi.org/10.1016/j.ijnsa.2021.100023	- Rate of 90-day death and dependency	- EHRs enhanced the implementation of FeSS protocol to improve outcomes for patients with acute stroke
Edwards et al. (2019)	Association of a multisite interprofessional education initiative with quality of primary care. JAMA network open, 2(11), e1915943-e1915943. doi:10.1001/jamanetworkopen.2019.15943	- Quality of care - Mental health referrals - Visits and hospitalizations - Hypertension control	- The study concluded that interprofessional collaboration improves and transforms care, leading to improved patient outcomes
Bingham et al. (2019)	The discharge companion program: an interprofessional collaboration in transitional care model delivery. Pharmacy, 7(2), 68. https://doi.org/10.3390%2Fphar	- Readmission rates - Costs of care	- The study shows there are potential benefits of the interprofessional, collaborative transition of care

	macy7020068				(TOC) model with various pharmacist-delivered MTM touchpoints within 30 days of hospital discharge
White-Williams et al. (2021)	An Interprofessional Collaborative Practice Can Reduce Heart Failure Hospital Readmissions and Costs in an Underserved Population. Journal of Cardiac Failure, 27(11), 1185-1194. https://doi.org/10.1016/j.cardfail.2021.04.011	-	Readmissions rates Costs of care	-	The interprofessional collaborative model improves patient outcomes by reducing costs and inpatient hospital days for patients with heart failure
Arana et al. (2017)	Reducing the length of stay, direct cost, and readmissions in total joint arthroplasty patients with an outcomes manager-led interprofessional team. Orthopaedic Nursing, 36(4), 279-284. DOI: 10.1097/NOR.0000000000000366	-	Length of stay Costs of care	-	Implementing a Collaborative Care Model (CCM) consisting of a manager-led interprofessional team improves care quality and patient outcomes by significantly reducing the length of stay and direct costs
Yashimoto et al. (2022)	The impact of interprofessional communication through ICT on health outcomes of older adults receiving home care in Japan–A retrospective cohort study. Journal of General and Family Medicine, 23(4), 233-240. https://doi.org/10.1002/jgf2.534	-	Risk of death or admission to a hospital or nursing home	-	An interprofessional collaboration care model that integrates ICT reduces the risk of death or admission to a hospital or nursing home among elderly patients
Soares et al. (2021)	An Interdisciplinary Approach to Reducing Errors in Extracted Electronic Health Record Data for Research. Perspectives in Health Information Management, 18(Spring). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8120677/	-	Medication errors	-	Prescription data is susceptible to missing information due to different data entry methods under EHRs - An interdisciplinary approach can be used to reduce these errors
Akindele (2019)	The Significance of Electronic Health Records to Reduction of Patient Safety Events in	-	Medical errors - Quality of care - Patient safety	-	Implementing EHRs can help reduce patient safety events

	Hospitals. The Anatolian Journal of Family Medicine, 2(1), 27-32. http://dx.doi.org/10.5505/anatoljfm.2018.09709				(PSEs), improve care quality, and reduce medical errors, making hospitals safer for all
Albagmi (2021)	The effectiveness of EMR implementation regarding reducing documentation errors and waiting time for patients in outpatient clinics: a systematic review. F1000Research, 10. https://doi.org/10.12688%2Ff1000research.45039.2	-	Patient waiting time Errors	-	Implementing electronic medical records (EMRs) reduces patient wait time and documentation errors, including medication dose errors and, issues of prescription errors
Wheeler et al. (2018)	Reducing medication errors at transitions of care is everyone's business. Australian prescriber, 41(3), 73-77. https://doi.org/10.18773%2Faustprescr.2018.021	-	Medication errors	-	Integrated care that involves multiple healthcare professionals and is facilitated by technology and shared accountability can reduce medication discrepancies and errors
Abomhara et al. (2018)	Sharing with care-multidisciplinary teams and secure access to electronic health records. In Proceedings of the 11th International Joint Conference on Biomedical Engineering Systems and Technologies, 5:Healthinf2018, 379-386. http://dx.doi.org/10.5220/0006562403790386	- - -	Quality of care Patient Satisfaction Patient safety	-	Integrating EHRs into multidisciplinary teams improves the creation, managing, and sharing of patient health information and facilitates easy coordination and communication between patients and healthcare providers, thus leading to higher patient satisfaction and engagement
Selby et al. (2019)	The value and future developments of multidisciplinary team cancer care. American Society of Clinical Oncology Educational Book, 39, 332-340.	-	Patient satisfaction and engagement	-	Efficient and patient-centered multidisciplinary teams enhance patient satisfaction, empowerment, and

	https://ascopubs.org/doi/full/10.1200/EDBK_236857				engagement
Subbe et al. (2021)	Impact of electronic health records on predefined safety outcomes in patients admitted to hospital: a scoping review. BMJ Open, 11(1), 1-11. http://dx.doi.org/10.1136/bmjopen-2020-047446	-	Quality and safety of patient care	-	Although there are potential positive consequences of implementing EHRs, there is limited evidence on safety outcomes following EHR implementation
Kawamoto et al. (2021)	Establishing a multidisciplinary initiative for interoperable electronic health record innovations at an academic medical center. JAMIA open, 4(3), p.ooab041. https://doi.org/10.1093/jamiaopen/ooab041	-	Quality of care Disease management	-	Effective implementation of digital innovations such EHRs requires interprofessional collaborations and partnerships The collaborations bring unique resources and expertise that improve practice and patient outcomes
Hazazi & Wilson (2021)	Leveraging electronic health records to improve management of noncommunicable diseases at primary healthcare centers in Saudi Arabia: a qualitative study. BMC Family Practice, 22(1), 1-6. https://doi.org/10.1186/s12875-021-01456-2	-	Disease management, self-management	-	EHR systems increase patient access to information, encouraging self-management Care coordination across EHR systems improves disease management
Durojaiye et al. (2019)	Evaluation of multidisciplinary collaboration in pediatric trauma care using EHR data. Journal of the American Medical Informatics Association, 26(6), 506-515. https://doi.org/10.1093/jamia/ocy184	-	Length of stay	-	Collaboration facilitated by EHR resulted in the more timely provision of care for pediatric trauma patients, reducing the length of stay
Gensheimer et al. (2018)	Oh, the places we'll go: patient-reported outcomes and electronic health records. The Patient-Patient-Centered Outcomes Research, 11(6),	- -	Quality of life Patient Satisfaction	-	A well-designed and integrated PRO (patient-reported system)-EHR system has multiple benefits,

	591-598. https://doi.org/10.1007/s40271-018-0321-9	including improved health services research, patient-centered care, and population health

Major Themes Identified in the Findings

The studies selected identified multiple themes associated with positive patient outcomes associated with integrating EHR in interprofessional collaboration care model, including readmission rates [9, 11, 13, 14, 15], length of stay [16, 27], quality of care [8, 10, 13, 19, 22, 24, 25], quality of life [9, 28], patient satisfaction [22, 23, 28], disease and weight management [8, 25, 26], reduced medical errors [18, 19, 20, 21], mental health [9, 13], patient safety [10, 19, 22], and costs of care [11, 14, 15, 16]. The findings are discussed in detail in the subsections below.

Readmissions, Hospitalizations, and Emergency Department Visits

The study findings indicate that integrating EHRs into the interprofessional collaboration model of care can significantly influence readmission rates, hospitalizations, and emergency department visits. A study involving cancer patients found that using interprofessional collaborative practice (ICP) in patient education reduced readmission rates [9]. These results were evident in another study that found that implementing ICP at a family medicine residency and faculty practice at a new ambulatory care center (ACC) reduced emergency department visits by 16.7% and hospitalizations by 17.7% [11]. While some readmissions are unavoidable, research shows that collaborative practice facilitated through EHRs can prevent readmissions through coordinated care, improved patient education, and reduced medical complications during the patient's initial hospitalization or visit [9, 14]. However, the reduction rates vary, with some studies showing statistically significant reductions while others indicate minor decreases [13]. In

addition, the reduction rates are associated with multiple factors, including the availability of transitional care [15], post-discharge medications, and follow-up activities.

Length of Stay

The length of stay (LOS) is a significant indicator of a healthcare facility's management efficiency. Reducing LOS is associated with multiple benefits ranging from lowering the risk of infection and medication side effects, enhancing the efficiency of bed management, and improving the quality of care. Research findings show that the collaborative care model significantly reduces LOS. For example, research in Baylor Dallas Orthopedic department implementing an interprofessional care model reduced LOS for primary total knee arthroplasties (TKAs) by 0.6 days and 0.4 days for primary total hip arthroplasties (THAs), saving 117 and 60 patient-days respectively for 6 months [16]. Although this research indicates the impact of interprofessional collaboration in improving patient outcomes, it doesn't specify the role of EHRs in this improvement. However, another study that studied collaborative EHR for healthcare practitioners providing care for pediatric trauma patients showed that interprofessional collaboration facilitated by EHRs improved the speed of care provision (47.9 minutes shorter), thus reducing LOS [27]. Therefore, implementing EHRs within multidisciplinary teams in care provision can reduce LOS and lead to higher patient outcomes.

Quality of Health Care

The research findings indicate that integrating EHRs within a collaborative care model can significantly improve the quality of care. For instance, research on the impact of engaging dieticians in multidisciplinary teams using electronic medical records shows that collaborative practice enhances the quality of care by enabling dietetic consultations and mitigating barriers to dietetic referrals by primary care providers [8]. Besides, introducing electronic patient records

for interprofessional collaboration and clinical workflows improves the overall quality of healthcare services by promoting effective communication, reducing billing errors, enhancing charge capture, improving the use of radiology tests, and savings on drug expenditures [10]. Under EHR-supported collaborative practice, the quality of care is often enhanced through higher patient engagement and participation in care [13] or increased focus on ensuring patient safety by all practitioners [19, 22, 24, 25]. The multiple healthcare practitioners involved in the collaborative care model utilize EHRs as a tool to adopt a patient-centered practice, thus delivering quality care.

Quality of Life

Evidence shows that integrating EHRs within an interprofessional collaborative care model improves patients' quality of life. For instance, a study on patient education for cancer patients revealed that an interprofessional team uses EHRs to deliver diverse educational topics in programs involving nurses, patients, and their caregivers [9]. This approach improves caretaking activities post-discharge, including acute medical management, thus improving the patient's quality of life. Similarly, research by Gensheimer et al. revealed that integrating patient-reported outcomes (PROs) into EHRs allows healthcare organizations to improve patient quality of life through well-planned and executed quality improvement initiatives and increased focus on patient-centered care [28]. EHRs integrated into multidisciplinary teams facilitate coordinated care that improves individual patients' health, comfort, and ability to enjoy life.

Patient Satisfaction

Collaborative practice within EHR systems is significantly connected to higher patient satisfaction. The collaborative care model's primary goal is to bring healthcare practitioners and organizations together to improve care quality [22]. One primary strategy that achieves this goal

is embracing EHRs among providers and patients to generate, handle and share patient information effectively and efficiently. The communication among participants ensures that patients are actively engaged throughout the decision-making process and are aware of their health conditions, thus improving their engagement and empowerment [23]. Consequently, engagement is highly associated with higher patient satisfaction [28]. EHRs' remote accessibility allows providers, patients, and caregivers to communicate and share information throughout the care delivery process, ensuring the active participation of all stakeholders.

Disease and Weight Management

The research findings show that managing chronic diseases requires effective collaborative relationships and appropriate systems among healthcare practitioners, patients, and caregivers. For example, a study involving multidisciplinary clinics utilizing EHRs to improve weight management found improved communication, knowledge exchange, timely referrals, convenient scheduling, and ongoing support that led to improved weight management [8]. In addition, digital innovations by external innovators were found to be essential in promoting chronic disease management. For instance, with the increased dominance of smartphones, EHR can be enhanced through third-party apps developed by innovators in the digital health sector [25]. These findings indicate collaborative practice can be extended beyond healthcare settings to allow convenient care delivery by increasing patients' access to information and essential programs through apps installed on their smartphones. Hazazi and Wilson researched the significance of EHRs in managing noncommunicable diseases. One of their interviewees reported that *"... electronic health is a milestone in the history of healthcare in Saudi Arabia. It improves the management of chronic diseases, raises the quality of health services, and reduces file errors"* [26, p.3]. Availability of patient information allows physicians to diagnose and treat

diseases more quickly, as well as make an appropriate follow-up to facilitate proper disease management and improve patient health outcomes.

Reduced Medical Errors

Medical errors are considered an indicator of poor quality of care that often leads to adverse patient outcomes, such as causing severe harm to the patient or, in some cases, death. One of the sources selected showed that 41.8% of respondents strongly agreed, while 48.6% simply agreed that EHR could reduce medical errors [19]. Most of these respondents believed that EHR reduces errors by eliminating issues associated with paper-based medical records and promoting e-prescription that enhances medication safety. These findings were also evident in another study that concluded that implementing electronic medical records reduced documentation errors, including medication dose errors and issues of prescription errors [20]. EHRs also eliminate medication discrepancies prevalent during hospital admission and discharge and when patients transition from one provider to another [21]. Integrating EHRs into a collaborative care model allows practitioners to ensure a smooth transition by sharing patient information and continuously communicating throughout the care delivery process. The system reduces the need for paper-based documentation, often characterized by mistakes that can significantly undermine patient health outcomes. This notion was evident in a study that showed that prescription data is susceptible to missing values due to the different data entry methods used by various practitioners in an interdisciplinary team [18]. EHRs allow practitioners to adopt a standardized data entry approach that best matches their workflow within the collaborative practice, reducing human error opportunities.

Costs of Care

Integrating EHRs into interprofessional collaborative care practice is associated with reducing costs of care and making healthcare more affordable and accessible. For instance, a study by Arana et al. found that the manager-led Collaborative Care Model (CCM) reduced direct costs for total hip arthroplasty (THA) by $1020 per patient case and $539 per case for total knee arthroplasty (TKA) [16]. Another study showed that interprofessional collaboration reduced total patient charges by 48.2%, indicating that patients pay less for quality care [11]. EHRs in collaborative practice allow practitioners to use patient information and clinical research to assess various aspects of care, including drug-disease interactions, appropriateness of medications, follow-up appointments, and barriers to medication adherence [14]. Besides, patient engagement under EHR-collaborative care improves self-care, leading to higher patient outcomes that include low admission rates [16]. In addition, the coordinated effort enables the multidisciplinary teams to employ well-organized teamwork, enhances documentation, and facilitates open communication. As a result, healthcare practitioners can identify potential complications and offer appropriate interventions on time, eliminating consequences such as hospitalizations and readmissions that would otherwise increase healthcare costs.

Discussion

Over the years, most hospitals have recognized the need for interdisciplinary care models and EHR systems to improve patient outcomes and enhance efficiencies. As a result, most hospitals have at least adopted the basic EHR systems, which contain patient data such as demographics, health issues, medication lists, and discharge summaries. However, most healthcare institutions have comprehensive EHR systems that comprise the data mentioned earlier and advanced functions such as laboratory and diagnostic test result management and computerized provider order entry such as requests for radiology or laboratory tests [29]. Using

these tools by multidisciplinary teams improves the quality of care and patient safety, leading to higher patient outcomes, as indicated in the study findings. For example, automated prescribing and test ordering reduce errors, thus increasing patient safety and enhancing the quality of care [10, 19, 22]. As a result, EHR-collaborative practice demonstrates effective and efficient integration processes and expertise to improve care delivery and patient outcomes.

Under the interprofessional care model, a patient moves through a care trajectory, interacting with different practitioners. For example, they might interact with a physician, nurse practitioner, dietitian, and pharmacist during a single clinical appointment. At the end of the visit, the patient information gathered throughout the care delivery process is expected to flow seamlessly and organized in a manner that can be effectively accessed in the subsequent patient visit. EHR systems are configured in ways that allow the flow of information among providers, patients, and caregivers and facilitate timely communication for quality care delivery. This coordination reduces medication errors, thus enhancing the quality of care and reducing hospitalizations and readmission rates [8, 13, 19]. In addition, it promotes patient-centered care that prioritizes patient safety and satisfaction over clinical outcomes, as evidenced in the research findings [17]. These findings align with other studies that indicate that embracing patient-centered health information technologies improves the quality of care and promotes shared decision-making [30]. When patients are part of decision-making, their engagement and satisfaction with healthcare processes are improved and may directly impact outcomes such as self-efficacy.

The study findings indicate that integrating EHRs into the interprofessional collaboration care model can significantly impact patient outcomes. For instance, the practice is associated with decreased length of stay [16, 27], increased capability to manage chronic diseases [8, 25,

26], and reduced risks of death [12, 17] and waiting time [20]. These positive outcomes result from multiple benefits and opportunities, such as increased access to patients' health data and improved communication that enables specialists within the collaborative care model to act quickly. Besides, these outcomes significantly impact other aspects of care delivery, such as cost reduction. For example, research findings indicate that reduced length of stay directly affected care costs [16]. In a coordinated interprofessional care model facilitated through EHR systems, a smooth flow of information and shared decision-making makes it possible for practitioners to deliver quality care services faster. In addition, EHR allows timely identification and intervention of patient problems and operational issues. As a result, the time taken to diagnose and treat patients is reduced, consequently lowering care costs per patient. These findings indicate that integrating EHRs into interdisciplinary teams can benefit the patients and the healthcare facilities.

While the research findings in this study focus on the positive impacts of EHR-collaborative practice on patient outcomes, the researcher acknowledges that collaborative care is associated with multiple barriers. For instance, Aboueid et al. found that EHRs as communication tools are underutilized, with only 14% of Canadian family physicians using 9 or more of the 14 electronic information functions [8]. Similarly, another study stated that only 25.6% of German clinics have fully functional EHR systems, noting barriers such as health policy, state funding, and digital health readiness as major hindrances [16]. Subbe et al. indicate that although there is general agreement on EHRs' role in improving the safe delivery of care, "it is unclear whether changes are due to improved practice or changed event reporting" (p.1). Other sources have associated EHRs integrated into the collaborative care model with challenges such as alert fatigue, reduced face-to-face patient care, workflow mismatches, and continuous

persistence of paper-based documentation [6]. These issues can result in adverse patient outcomes such as readmissions and hospitalizations resulting from prescription errors and low quality of care. Therefore, further research demonstrating measures undertaken to mitigate these problems and promote successful implementation of EHRs within the interprofessional collaborative practice is recommended.

Conclusion

The primary focus of this research was to evaluate the impact of integrating EHRs within an interprofessional collaborative care model on patient outcomes. The sources selected and analyzed indicate that EHR-collaborative care reduces hospitalizations, emergency department visits, length of stay, and readmission rates, improves the quality of care, reduces costs, improves patient satisfaction and safety, enhances disease and weight management, and mitigates errors. In addition, the practice promotes the delivery of patient-centered care that focuses on adopting the best care practice to improve patients' wellbeing. However, some resources recognize potential challenges that hinder EHR-collaborative practice, including reduced face-to-face patient care and under-utilized EHR tools. Sometimes, the EHR systems are not configured to function in different clinical settings, potentially undermining interprofessional collaboration and coordination. These inconsistencies indicate the need for further research to determine the various strategies adopted to eliminate potential challenges threatening the successful implementation of EHRs within the interprofessional collaboration care model.

Limitations

This review has some limitations. Firstly, although various key terms were used to search for literature, there is a possibility that some relevant studies might have been left out due to the reliance on two databases, PubMed and Google Scholar. Secondly, publication bias may exist as

the inclusion and exclusion criteria eliminated gray literature such as working papers, dissertations, government documents, and reports. Thirdly, the literature search was limited to studies published in English. As a result, the synthesized information may not be generalized in non-English research.

List of Abbreviations

EHR: Electronic Health Records

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

CCM: Collaborative Care Model

ICP: Interprofessional Collaborative Practice

AAC: Ambulatory Care Center

LOS: The Length of Stay

THA: Total Hip Arthroplasties

PRO: Patient-Reported Outcomes

CCM: Collaborative Care Model

TKA: Total Knee Arthroplasty

Declarations

Ethics approval and consent to participate

Not Applicable

Consent for publication

Not Applicable

Availability of data and material

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Competing interests

The author declares that they have no competing interests

Funding

There are no financial conflicts of interest to disclose.

Authors' contributions

Saeed Alghamdi collected, interpreted, and analyzed the data presented in the final manuscript.

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