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# HOSPITAL EFFICIENCY USING ELECTRONIC HEALTH RECORDS FOR PATIENT SERVICE QUALITY: LITERATURE REVIEW

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**Abstract**

**Introduction**: Electronic Health Records (EHRs) are computerized medical information systems that collect, store, and display patient's health and clinical information electronically. The use of electronic health records has rapidly grown as an important tool in the modern healthcare system. EHRs are designed to improve hospital operational efficiency and improve patient service quality. The aim of the article is to determine the hospital efficiency using electronic health records for patient service quality. This topic is interesting because EHRs are a technology that promises substantial improvements in the healthcare system, but its impact is still mixed and requires thorough evaluation.

**Research Methods**: This study uses a systematic review of literature to determine the hospital efficiency using electronic health records for patient service quality. Data were collected from databases such as wiley online library, science direct, pubmed, with keywords such as "electronic health records", "hospital efficiency", and "patient service quality". The selected studies were articles published in the last 5 years, full papers are available that can be accessed, articles in english.

**Finding/Results**: The findings of this review indicate that EHRs implementation generally contributes to increased hospital efficiency by reducing medical errors, speeding up administrative processes, and improving coordination between departments. In addition, EHRs are often associated with improved patient service quality, including diagnostic accuracy and patient satisfaction. Moreover, the use of EHRs enhances data security and supports better decision-making through real-time access to patient information. EHRs with health information technology have the potential to reduce medical costs.

**Keywords:** Electronic Health Records, Hospital Efficiency, Patient Service Quality

## INTRODUCTION

A hospital is a health service facility that provides comprehensive individual health services through promotive, preventive, curative, rehabilitative and/or palliative health services by providing inpatient, outpatient and emergency services (Undang-Undang RI No 17, 2023). Medical Records are documents containing patient identity data, examination results, treatments, actions, and other services that have been provided to patients. Medical Records aim to improve the quality of health services, provide legal certainty in the implementation and management of Medical Records, ensure the security, confidentiality, integrity, and availability of Medical Record data, and realize the implementation and management of digital and integrated Medical Records. Electronic Medical Records are Medical Records created using an electronic system intended for the implementation of Medical Records. Every Health Service Facility is required to implement Electronic Medical Records (Permenkes No 24, 2022).

Electronic Health Records (EHRs) represent a significant evolution in healthcare. They mark a shift from traditional paper-based record-keeping to a digital and more integrated approach to managing patient information. (Enahoro Q.E., et al, 2024). Electronic Health Records (EHRs) are computerized medical information systems that collect, store and display patient health and clinical information electronically (Boonstra, A., et al, 2022). Electronic Health Record (EHR) has provided instant benefits to medical organizations by reducing administrative activities and ensuring data availability. The purpose of creating EHR is to be able to analyze large, varied, and unstructured healthcare data and gain meaningful insights through analytical and decision-making tools (Cunha, J., et al. 2022). The primary goal of an EHR is to ensure that accurate and complete patient health information is quickly available, enabling healthcare providers to make informed decisions, provide efficient services, and ultimately improve their patients' health outcomes (Enahoro, Q.E., et al, 2024). EHR systems support the delivery of care, reduce medical error rates, support decision-making activities, order tests and treatments, and improve benefit costing, and enhance the quality of health services (Helmers, R., et al, 2019).

Implementing EHRs improves service quality more optimally than paper medical records (PMRs). EHRs enable healthcare providers to access and update patient information in real-time, quickly and accurately, increasing patient comfort and reducing waiting times (Setyadi

and Nadjib, 2023). EHRs facilitate better communication among healthcare professionals, improve the quality-adjusted life year (QALY) of patients, and reduce mortality rates. They are also effective in managing diseases better, improving medical decision-support tools, and reporting standards for patient medical records (Pratama, 2024).

## LITERATURE REVIEW

1. Electronic Health Records

The evolution of information technology has continued to put pressure on healthcare systems to switch from manual to electronic systems. Electronic health record (EHR) is a leading information technology system that has drawn considerable interest from governments and private health facilities (Gatiti et al., 2021). Electronic Health Records (EHRs) represent a significant evolution in healthcare. This marks a departure from traditional paper-based records towards a digital and more integrated approach to managing patient information. EHRs systematically collect health-related information on patients that is stored in a digital format that is accessible across different healthcare settings (Reza, Prieto and Julien, 2020).

The primary purpose of EHRs is to ensure that accurate and complete patient health information is available promptly, enabling healthcare providers to make informed decisions, provide efficient care, and ultimately improve the health outcomes of their patients (Li et al., 2020). EHR provides opportunities to improve healthcare, entrench performance measures in healthcare, and enhance patient identification and healthcare professions in healthcare research. EHR is implemented in hospitals with a view of improving the quality of healthcare services. They provide a significant chance to enhance health surveillance and appraise service delivery, which can result in the development in the promotion and management of public health and better clinical decision (Dornan et al, 2019).

EHRs facilitate the seamless exchange of patient information among healthcare providers, contributing to a more coordinated and patient-centred approach to care. By providing healthcare professionals with immediate access to comprehensive patient information, EHRs enhance the ability to diagnose diseases accurately, reduce medical

errors, and ensure that patients receive appropriate treatments promptly. Furthermore, EHRs support public health initiatives by aggregating and analyzing patient data, aiding disease surveillance, and advancing population health research (Hohman et al., 2023).

The adoption of Electronic Health Records has profoundly impacted healthcare delivery, touching on every aspect, from efficiency and productivity to the quality of care and interdisciplinary collaboration. This comprehensive integration of digital records into the healthcare system has streamlined administrative and clinical processes and significantly enhanced patient care delivery (Enahoro et al 2024). The implementation of Electronic Health Records has significantly influenced patient outcomes, contributing to enhanced patient safety, increased patient engagement, and overall improvements in health outcomes. EHRs have become a cornerstone for higher-quality care and better patient health through error reduction, improved patient monitoring, and enhanced communication (Enahoro et al 2024).

2. Hospital Efficiency

A hospital is a health service facility that provides comprehensive individual health services through promotive, preventive, curative, rehabilitative and/or palliative health services by providing inpatient, outpatient and emergency services. One of the principles of service in hospitals is efficient service (Undang-Undang RI No 17, 2023). Hospitals play a crucial role in the healthcare system and require ongoing efforts to maintain efficient and optimal operations (Anjani, Y., et al, 2024). Efficiency is one of the performance indicators that theoretically underlies the entire performance of the hospital. Efficiency can be used to allocate resources more precisely so that resources sourced from shareholders can be utilized optimally. Assessment of service efficiency is an assessment of managerial capabilities in the context of processing human resources, funding sources, equipment, and technology, in order to provide health services to patients (Srimayarti, B.N., et al, 2021).

According to Pooja Malhotra in the book principles and practices of management, efficiency refers to achieve goals with optimum utilization of resources, that is, to make the best possible use of limited resources, viz, men, money, machinery, materials etc. Efficiency measures the relation between inputs and outputs. it determines the extent to which an organization has employed its inputs optimally, i.e. use the limited resources in a best possible manner to give output. Efficiency refers to “Doing things right” (Sharma, T., 2018).

Hospital efficiency is the foundation and leverage for improving the development of the health care system. It is important for hospitals to maintain the level of quality in their health care services and at the same time achieve efficient production at the lowest possible cost. Hospital efficiency is a complex economic concept that depends on factors that can be easily changed, thus differentiating the operation and efficient performance of the hospital. This is due to the special demands that result from the pursuit of good health (Chletsos, M., et al, 2019). Efficiency in hospitals is measured using various methods and indicators, such as the cost-efficiency ratio, labor productivity, bed utilization rate, data envelopment analysis, net profit ratio, and others. The evaluation of efficiency involves comparing the achieved results with the resources and efforts used (Anjani, Y., et al, 2024).

3. Patient Service Quality

Patient Service Quality refers to the extent to which healthcare services meet or exceed patient expectations, emphasizing the delivery of care that is safe, effective, patient-centered, timely, efficient, and equitable. It encompasses various aspects of the patient's interaction with the healthcare system, including the quality of medical treatment, communication, comfort, accessibility, and overall satisfaction (Manzoor et al., 2019).

In healthcare delivery, patient service quality is a critical indicator for assessing the performance of healthcare facilities and professionals. It is determined not only by clinical outcomes but also by the patient's experience throughout the care process. This involves healthcare providers' ability to understand and meet patient needs, preferences, and values, as well as providing clear information and supporting patient involvement in decision-making (Ali et al., 2020).

Enhancing patient service quality positively impacts patient satisfaction, trust, and loyalty toward the healthcare system. High-quality patient services can reduce medical errors, improve health outcomes, and increase operational efficiency within healthcare organizations. Therefore, continuous efforts to enhance patient service quality are essential for healthcare providers aiming to achieve optimal standards of care (Wu & Lu, 2021).

## RESEARCH METHODOLOGY

The research method used is a literature review. A literature review is a critical process in collecting, transmitting, and synthesizing various sources of literature that are relevant to the research topic so that an in-depth understanding of current research developments and identifying existing research combinations can be obtained. This study uses the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) method. There are five stages used in the PRISMA method, namely defining eligibility criteria, defining information sources, selecting literature, collecting data, and selecting data items. The articles collected were obtained from the Wiley Online Library, Science Direct, and Pubmed databases. The keywords used were electronic health records, hospital efficiency, and patient service quality. The selected articles were those that met the inclusion criteria, namely relevant articles with the last five years of publication, complete articles that can be accessed, and articles in English.

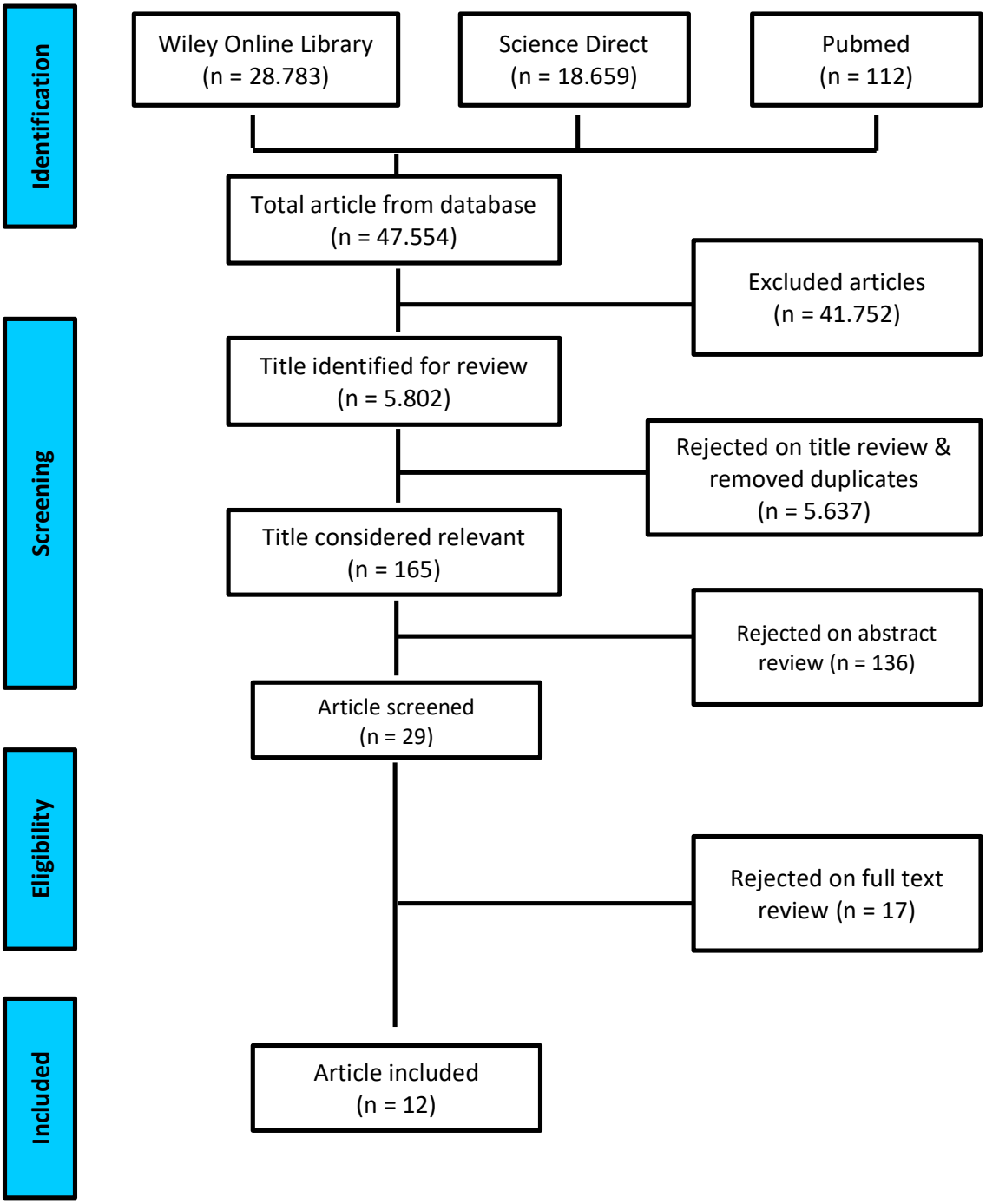


Figure 1. PRISMA flow diagram

Based on the PRISMA method, 47,554 articles related to keywords were obtained. There were 41,752 articles excluded because they did not meet the inclusion criteria. Of the total 5,802 articles identified, 5,637 articles were excluded because there were duplications and irrelevant titles. 29 articles were obtained from the results of screening based on

relevant titles and abstracts. After reviewing the full text articles, there were 12 articles that met the requirements and could be used as research data.

## RESULT AND DISCUSSION

### 1. RESULT

**Table 1. Result of article selection**

| No | Author | Year | Title | Method | Result |
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| 1 | Bustin, et al | 2024 | Feasibility of a contraceptive specific electronic health record system to promote the adoption of pharmacist-prescribed contraceptive services in community pharmacies in the United States | 20 pharmacists each performed two standardized patient encounter simulations: one on the EHR and one on the current standard of care paper-based workflow. A crossover study design was utilized, with each pharmacist performing encounters on both standardized patients with the modality order randomized. Encounters were timed, contraceptive outputs were recorded, and the pharmacists completed externally validated workload and usability surveys after each encounter, and a Perception, Attitude, and Satisfaction survey created by the research team after the final encounter. | Pharmacists were more likely to identify contraceptive ineligibility using the EHR-based workflow compared to the paper workflow (P ¼ .003). Contraceptive encounter time was not significantly different between the 2 modalities (P ¼ .280). Pharmacists reported lower mental demand (P ¼ .003) and greater perceived usefulness (P ¼ .029) with the EHR-based workflow compared to the paper modality. |
| 2 | Hubbar | 2021 | Studying | This study introduced | In a sample of 49,062 |

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| | d, et al | | pediatric health outcomes with electronic health records using Bayesian clustering and trajectory analysis | Bayesian combined phenotyping and BMI trajectory models to address data quality challenges in EHR-based studies of early-life BMI and type 2 diabetes in adolescence by comparing this combined modeling approach with traditional approaches that use computable phenotypes for diabetes type 2 or BMI trajectories and type 2 diabetes phenotypes were estimated separately. This study used an EHR-derived dataset from the PEDSnet consortium (pedsnet.org) to investigate the association between early-life BMI trajectories and subsequent incidence of pediatric type 2 diabetes. Inclusion criteria were children recorded in the database of one of the six PEDSnet sites, had at least 4 recorded BMI measurements between ages 2 and 9 years and at least 2 health care encounters between ages 10 and 14 years, had at least one BMI z score that exceeds | children derived from the PEDSnet consortium of pediatric healthcare systems, a median 8 (interquartile range [IQR] 5–13) BMI measurements were available to charac-terize the early-life BMI trajectory. The joint modeling and computable phenotype approaches found that age at adiposity rebound between 5 and 9 years was associated with higher odds of type 2 diabetes in adolescence compared to age at adiposity rebound between 2 and 5 years (joint model odds ratio [OR] = 1.77; computable phenotype OR = 1.88) and that BMI in excess of 140% of the 95th percentile for age and sex at age 9 years was associated with higher odds of type 2 diabetes in adolescence relative to children with BMI from 100 to 120% of the 95th percentile (joint model OR = 6.22; computable phenotype OR = 13.25). Estimates from the separate phenotyping and |

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| | | | | the 95th percentile for age and gender between the ages of 9 and 18 years. Children with a diagnosis code for type 1 diabetes were excluded. | trajectory model were substantially attenuated towards the null. These results demonstrate that EHR data coupled with modern methodologic approaches can improve efficiency and timeliness of studies of childhood exposures and rare health outcomes. |
| 3 | Pai, et al | 2022 | Do EHR and HIE deliver on their promise? Analysis of Pennsylvania acute care hospitals | Multivariable regression models using panel data with year fixed effects and hospital individual effects were used. Outcome variables were readmission index and mortality index (quality of care), cost per inpatient day and cost per inpatient admission (hospital efficiency), and average length of stay (patient flow). We use two variables to measure HIT usage – proportion of functionalities owned/utilized under electronic health records (EHR) and HIE. We use four years of data (2014-17) on 115 acute care hospitals in Pennsylvania from five different data sources. | The results found that there was evidence of a positive association between HIE and efficiency measures (cost reduces with increased use of HIE) and a positive association between EHR adoption and quality of care (lower mortality with increased use of EHR). In addition, HIE is adversely associated with mortality. Other effects were not significant. |
| 4 | Swinckels, et al | 2024 | The use of deep learning and machine | This study was conducted according to the PRISMA | In total, 20 studies were included, mainly published |

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| | | | learning on longitudinal electronic health records for the early detection and prevention of disease: Scoping Review | (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. A literature search was performed in 2022 in collaboration with a medical information specialist in the following databases: PubMed, Embase, Web of Science Core Collection (Clarivate Analytics), and IEEE Xplore Digital Library and computer science bibliography. Studies were eligible when longitudinal EHRs were used that aimed for the early detection of disease via ML in a prevention context. Studies with a technical focus or using imaging or hospital admission data were beyond the scope of this review. Study screening and selection and data extraction were performed independently by 2 researchers. | between 2018 and 2022. They showed that a variety of diseases could be detected or predicted, particularly diabetes; kidney diseases; diseases of the circulatory system; and mental, behavioral, and neurodevelopmental disorders. Demographics, symptoms, procedures, laboratory test results, diagnoses, medications, and BMI were frequently used EHR data in basic recurrent neural network or long short-term memory techniques. By developing and comparing ML and DL models, medical insights such as a high diagnostic performance, an earlier detection, the most important predictors, and additional health indicators were obtained. A clinical benefit that has been evaluated positively was preliminary screening. If these models are applied in practice, patients might also benefit from personalized |

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| | | | | | health care and prevention, with practical benefits such as workload reduction and policy insights. |
| 5 | Wang, et al | 2024 | Electronic health record and primary care physician self-reported quality of care: a multilevel study in China | A total of 224 primary care physicians from 38 community health centres (CHCs) in four large Chinese cities participated in a cross-sectional survey to assess CHC care quality. Each CHC director scored their CHC's EHR functionality on the availability of ten typical features covering health information, data, results management, patient access, and clinical decision support. Data analysis utilised hierarchical linear modelling. | The availability of five EHR features was positively associated with physician self reported clinical quality: share records online with providers outside the practice (β = 0.276, p = 0.04), access records online by the patient (β = 0.325, p = 0.04), alert provider of potential prescription problems (β = 0.353, p = 0.04), send the patient reminders for care (β = 0.419, p = 0.003), and list patients by diagnosis or health risk (β = 0.282, p = 0.04). However, no association was found between specific features availability or total features score and physician self-reported preventive quality. |
| 6 | Poulos, et al | 2021 | Data gaps in electronic health record (EHR) systems: an audit of problem list completeness | Design: Retrospective chart review with manual review of free text electronic case notes. Setting: Major teaching hospital trust | Prior to review, these patients had a combined total of 2841 diagnoses recorded in their EHR problem lists. 1722 additional diagnoses |

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| | | | during the COVID-19 pandemic | in London, one year after the launch of a comprehensive EHR system (Epic), during the first peak of the COVID-19 pandemic in the UK. Participants: 516 patients with suspected or confirmed COVID-19. Main outcome measures: Percentage of diagnoses already included in the structured problem list. | were identified, increasing the mean number of recorded problems per patient from 5.51 to 8.84. The overall percentage of diagnoses originally included in the problem list was 62.3% (2841 / 4563, 95% confidence interval 60.8%, 63.7%). |
| 7 | Xiao, et al | 2022 | Assessing resident cataract surgical outcomes using electronic health record data | Design: Retrospective analysis. Subjects: Resident and faculty surgeons. Methods: Electronic health record data were collected from cataract surgeries performed at the Johns Hopkins Wilmer Eye Institute, and cases were categorized into resident or attending as primary surgeon. Pre-operative and postoperative visual acuity (VA) and unplanned return to operating room were extracted from the EHR. Main Outcome Measures: Postoperative VA and reoperation rate within 90 days. | This study analyzed 14 537 cataract surgery cases over 32 months. Data were extracted from the EHR using an automated approach to assess surgical outcomes for resident and attending surgeons. Of 337 resident surgeries with both preoperative and postoperative VA data, 248 cases (74%) had better postoperative VA, and 170 cases (51%) had more than 2 lines improvement. There was no statistical difference in the proportion of cases with better postoperative VA or more than 2 lines improvement between resident and attending cases. |

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| | | | | | Attending surgeons had a statistically greater proportion of cases with postoperative VA better than 20/40, but this finding has to be considered in the context that, on average, resident cases started out with poorer baseline VA. A multivariable regression model of VA outcomes vs. resident/attending status that controlled for preoperative VA, patient age, American Society of Anesthesiologists (ASA) score, and estimated income found that resident status, preoperative VA, patient age, ASA score, and estimated income were all significant predictors of VA. The rate of unplanned return to the operating room within 90 days of cataract surgery was not statistically different between resident (1.8%) and attending (1.2%) surgeons. |
| 8 | Steinberg, et al | 2023 | Electronic health record prompt to improving lung cancer screening in primary care | This study was conducted in the Rutgers Robert Wood Johnson Medical Group, a university-affiliated network in New Brunswick, NJ. Two novel EHR | The adjusted odds of patient record completeness to determine eligibility for low-dose computed tomography (AOR=1.19, 95% |

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| | | | | workflow prompts were implemented on July 1, 2018. These prompts included fields to determine tobacco use and lung cancer screening eligibility and facilitated low-dose computed tomography ordering for eligible patients. The prompts were designed to improve tobacco use data entry, allowing for better lung cancer screening eligibility identification. Data were analyzed in 2022 retrospectively for the period July 1, 2017 to June 30, 2019. The analyses represented 48,704 total patient visits. | CI=1.15, 1.23), eligibility for low-dose computed tomography (AOR=1.59, 95% CI=1.38, 1.82), and whether low-dose computed tomography was ordered (AOR=1.04, 95% CI=1.01, 1.07) all significantly increased after the electronic medical record prompts were implemented. |
| 9 | Bitner, et al | 2019 | Standardized care protocol and modifications to electronic health records to facilitate venous ulcer healing | We performed a retrospective review of a prospective database from September 2014 to May 2017. Modifications to the EMR included the formation of a venous ulcer patient list, a dressing tracker, calculation of total ulcer area, graphing of ulcer size over time, and images of the wound area. Patient education materials were created through the EMR and loaded into an automatic end-visit | During the study period, 204 patients with chronic C5 and C6 disease were observed. Before the start of the project, the healing rate was 53.3%. Wound healing rates improved from 59.5% (quarter 1) to 77.94% (quarter 8). In the quarter before the project started, there were no patients who had quit or cut down on smoking or smokeless tobacco, no patients who were referred for weight loss consultation, and |

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| | | | | printout that emphasized smoking cessation, weight loss, and consultation with specialty services as necessary. Quarterly meetings with the supervising physician were established to review each patient's wound progress and to target areas of improvement. | nine who were already patients of bariatric surgery. During the study period, 29% of patients quit smoking, 19% decreased smoking, and 20% cut down smokeless tobacco use. There were 54 patients who underwent advanced arterial evaluation; 175 patients underwent sclerotherapy and 137 patients had endovenous thermal ablation to treat axial reflux in the affected limb. The EMR modification project took 13 months to craft and to implement, with approximately 8 hours of meeting time from the surgical team. |
| 10 | Klappe, et al | 2023 | Correctly structured problem lists to better and faster clinical decision-making in electronic health records compared to non-curated problem lists: a single-blinded crossover randomized controlled trial | Two versions of two patient records (A and B) were created in an EHR training environment: one version included diagnosis information structured and coded on the problem list ("correctly structured problem list"), the other version had missing problem list diagnoses and diagnosis information partly documented in free text ("non- | As planned, 160 participants enrolled. Two were excluded for not meeting inclusion criteria. Correctly structured problem lists increased providers' ability to answer the comparison question correctly (56.3 % versus 33.5 %, McNemar odds ratio 2.80 (1.65–4.93) 95 %-CI). Median time to answer both questions correctly |

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| | | | | curated problem list"). In this single-blinded crossover randomized controlled trial, healthcare providers, who can prescribe medications, from two Dutch university medical center locations first evaluated a randomized version of patient A, then B. Participants were asked to motivate their answer to two medication prescription questions. One (test) question required information similarly presented in both record versions. The second (comparison) question required information documented on problem lists and/or in notes. The primary outcome measure was the correctness of the motivated answer to the comparison question. Secondary outcome measure was the time to answer and motivate both questions correctly. | was significantly lower for EHRs with correctly structured problem lists (Wilcoxon-signed-rank test p = 0.00002, with incorrect answers coded equally at slowest time). Correctly structured problem lists lead to better and faster clinical decision-making. Increased structured problem lists usage may be warranted for which implementation policies should be developed. |
| 11 | Lin, et al | 2020 | Association between electronic medical records and healthcare quality | We performed an observational study using discharge data from Tri-service General Hospital from 2013 to 2018. The levels of EMR | In total, 262,569 patients were included in this study. Compared with no EMRs, full EMR implementation led to lower inpatient |

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| | | | | utilization were divided into no EMRs, partial EMRs and full EMRs. The primary healthcare quality indicators were inpatient mortality, readmission within 14 days, and 48-hour postoperative mortality. We performed a Cox proportional hazards regression analysis to evaluate the relationship between the EMR utilization level and healthcare quality. | mortality [adjusted hazard ratio (HR) 0.947, 95% confidence interval (CI): 0.897–0.999, P = ..049] and a lower risk of readmission within 14 days (adjusted HR 0.627, 95% CI: 0.577–0.681, P < .001). Full EMR implementation was associated was a lower risk of 48-hour postoperative mortality (adjusted HR 0.372, 95% CI: 0.208–0.665, P = .001) than no EMRs. Partial EMR implementation was associated with a higher risk of readmission within 14 days than no EMRs (HR 1.387, 95% CI: 1.298–1.485, P < .001). Full EMR adoption improves healthcare quality in medical institutions treating severely ill patients. A prospective study is needed to confirm this finding. |
| 12 | Antor, et al | 2024 | Usability evaluation of electronic health records at the trauma and emergency directorates at the Komfo Anokye teaching hospital in the Ashanti region of Ghana | A quantitative cross-sectional technique was utilised to collect data from 234 trauma and emergency department staff members via standardised questionnaires. The participants were selected using the purposive sampling | The study discovered that a sizable number of respondents (86.8%) embraced and actively used the EHRs system. However, other issues were noted, including insufficient system training and malfunctions (35.9%), power outages |

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| | | | | method. The Pearson Chi-square Test was used to examine the relationship between respondents' acceptability and use of EHRs. | (18.8%), privacy concerns (9.4%), and insufficient maintenance (4.7%). The respondents' comfortability in using the electronic health record system (X2=11.30, p=0.001), system dependability (X2=30.74, p=0.0001), and EHR's ability to reduce patient waiting time (X2=14.39, p=0.0001) were all strongly associated with their degree of satisfaction with the system. Furthermore, respondents who said elects increase patient care (X2= 75.59, p = 0.0001) and income creation (X2= 8.48, p = 0.004), which is related to the acceptability of the electronic health records system. |

## 2. DISCUSSION

The EHR is the way medicine is practiced, and this project illustrates that modifications to the EHR benefit not only patients but clinicians as well. By enrolling patients in this program and logging the details of their care, we were able to quickly and accurately assess the history of the wounds and the progress being made. After the initial time investment by the wound care representative and the Epic team, daily use of the program seemed to be no more time intensive than standard visit documentation and yielded better longitudinal results. Operationalizing care aspects, such as dressing takedown and wound measurement, and recording of these by medical assistants greatly enhanced efficiency and use of the program (Biner et al., 2019).

Longitudinal HER has been shown to be useful for support in healthcare. Current ML models on HER can support disease detection in terms of accuracy and offer early screening benefits. Regarding disease prevention, ML models and especially DL models can accurately predict or detect diseases earlier than current clinical diagnoses (Swinckels et al., 2024). Despite evidence of the benefits of early detection and clinical practice guidelines, LDCT lung cancer screening is widely underutilized. This study shows the utility of EHR prompt implementation to accurately record tobacco use and intensity, allowing for easier identification of patients eligible for lung cancer screening and corresponding increases in LDCT utilization (Steinberg et al., 2023).

EHR-based approach provides a proof of concept that EHR data could be used in an automated and ongoing way to evaluate cataract surgery outcomes. This utilization of EHR data can inform educational changes by making it easy to analyze outcomes before and after an intervention to improve resident training. The process of extracting and then reanalyzing the data can be done in minutes to hours whereas reviewing charts manually would take days to weeks of someone's time. Leveraging EHR data in this way can provide an ongoing way to monitor surgical outcomes both during and after training (Xiao et al., 2022). Diagnoses and other clinical information stored in a structured way in electronic health records is extremely useful for supporting clinical decisions, improving patient care and enabling research. However, one year after implementation of a comprehensive electronic health record in a major teaching hospital, recording of medical history on the structured problem list for inpatients is incomplete, with almost 40% of important diagnoses mentioned only in the free text notes (Paulos et al., 2021).

These results demonstrate that EHR data coupled with modern methodologic approaches can improve efficiency and timeliness of studies of childhood exposures and rare health outcomes (Hubbard et al., 2021). The findings of the study discovered that health service providers at the directorate accepted the introduction of the record system into their daily activities, however, it was found that the level of acceptance of the electronic health record system was much higher. In determining the contributions of health service providers' acceptability and use of the system, it was found that the comfortability, and reliability of the system infuence service providers' acceptability and usability. Additionally, the system's ability to improve patient care and enhance revenue generation

increases staf acceptability and use of the electronic health record system (Antor et al., 2024).

This study found a potential association between the levels of EMR use and the risk of several outcomes in hospitalized patients in 1 large hospital. Healthcare quality is affected by diverse and complex characteristics. During the process of EMR implementation, appropriate training is needed to decrease the burden on physicians and nurses and preserve efficiency. Therefore, we believe that different levels of EMR adoption contribute to the quality of healthcare (Lin et al., 2020). Pharmacist performance and acceptance of contraceptive services delivery were improved with the EHR workflow. Pharmacist-specific contraceptive EHR workflows show potential to improve pharmacist adoption and provision of appropriate contraceptive care (Bustin et al., 2024).

EHR has a positive and statistically significant relationship with a measure of quality (mortality index) but is not significantly related to measures of efficiency or patient flow, whereas HIE has a positive and statistically significant relationship to one measure of efficiency (cost per day). The higher the use of HIE, the lower the cost (Pai et al., 2022). Availability of EHR systems and specific features of these systems are positively associated with self-reported quality of care by physicians in 38 CHCs, namely sharing bold notes with providers outside the practice, accessing bold notes by patients, notifying providers of potential prescription issues, sending reminders to patients for care, and listing patients by diagnosis or health risk. Sharing health information across healthcare organizations plays a critical role in the healthcare system, particularly in improving the quality of healthcare. By sharing health information across organizations, healthcare providers can quickly access patient information to make informed decisions about optimal care while preventing medical errors and adverse events and reducing readmissions and emergency room use. (Wang et al., 2024).

This study shows that providers' ability for correct clinical decisions increased significantly when using EHRs with correctly structured problem lists and that they answer in significant less time. It is important to encourage healthcare providers to adopt structured problem lists in their clinical practice. Further research is needed to determine the best strategy for deploying problem list-oriented medical records. The impact of problem lists should be evaluated in different settings, with different use cases, such as their impact on diagnostic decision-support or treatment suggestions when structured correctly.

These evaluations should consider the cost of creating and updating a problem list. By doing so, healthcare providers can continue to enhance their clinical decision making and ultimately improve patient outcomes (Klappe et al., 2023).

The findings of this review indicate that EHRs implementation generally contributes to increased hospital efficiency by reducing medical errors, speeding up administrative processes, and improving coordination between departments. In addition, EHRs are often associated with improved patient service quality, including diagnostic accuracy and patient satisfaction. Moreover, the use of EHRs enhances data security and supports better decision-making through real-time access to patient information. EHRs with health information technology have the potential to reduce medical costs.

## CONCLUSION

The conclusion of various studies on the implementation and benefits of EHR (Electronic Health Records) shows that EHR has a positive impact on both patients and medical personnel. EHR can improve the efficiency, accuracy, and completeness of medical documentation, accelerate the clinical decision-making process, and facilitate longitudinal monitoring of treatment outcomes. In addition, EHR supports early detection of disease through the integration of machine learning (ML) and deep learning (DL) models, which allows for faster and more accurate diagnosis. Utilization of EHR data can also improve medical training and assist in the evaluation of clinical education interventions. However, challenges in EHR implementation, such as the need for proper training for medical personnel and optimization of structured problem lists, still need to be addressed to ensure better clinical efficiency and accuracy.

Overall, EHR has been shown to improve the quality of health care, simplify administrative processes, and assist health research, although the adoption and implementation of this system still requires a careful approach to maximize its benefits.

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