DEDER GENERAL HOSPITAL

Evaluating the Impact of Electronic Medical Record Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency: A Pre-Post Study at Deder General Hospital, Oromia Region, Eastern Ethiopia

Gap Oriented Research Proposal

By:

1. **Nuredin Yigezu (BSC, MPH)-CEO**
2. **Redwan Sharafuddin-Plan Unit Head**

Major advisor:

1. Dr. Isak Abdi (MD, Senior)

Co-advisors

1. Dr. Taju Abdi (MD, Senior)
2. Abdi Tofik (BSc, MPH)
3. Dr.Derese Gosa (GP)

November 2024

Deder, Oromia, Eastern Ethiopia

ACKNOWLEDGEMENT

I extend my deepest gratitude to the Oromia Regional Health Bureau for granting me the opportunity and support to conduct this research.

I am profoundly grateful to my advisors—Dr. Isak Abdi, Dr. Taju Abdi, and Abdi Tofik—for their invaluable guidance, critical feedback, and unwavering mentorship throughout the research process. Their expertise and encouragement will be instrumental in shaping this study.

I sincerely thank the management and staff of Deder General Hospital for their cooperation, facilitation, and access to essential data and facilities. Without their support, the successful completion of this study would not have been possible.

I acknowledge the Federal Ministry of Health and its donor partners for their commitment to digital health transformation in Ethiopia, which laid the foundation for this evaluation.

BIIROO FAYYAA OROMIYAA
ORMIA HEALTH BUREAU

Guyyaa Date ቀን 20/3/2017
Lakk Ref.no ቁጥር BFO/HQ/68/17

To Deder General Hospital

Deder

Subject: Ethical approval

The research project **titled, Evaluating the Impact of Electronic Medical Records on Quality, Accuracy, and Efficiency of Health Documentation at Deder General Hospital: A Pre-Post Intervention Study at Deder General Hospital November, 2024"** is going to conduct in Oromia Region. Based on the principal investigator`s **Nuredin Yigezu (PI)** request for ethical approval, the Oromia Regional Health Bureau research ethics review board has reviewed the aforementioned research protocol in an expedited manner. We are writing to advise you that Oromia Regional Health Bureau research ethics review board has granted full approval and decided to give this ethical approval letter internalizing the existing problem and the study eventually come up with possible solutions.

We, therefore, request you as your esteemed organization to ensure the commencement and conduct of the study accordingly and wish for the successful completion of the study. You are required to submit the final report to the IRB of Oromia Health bureau Health research team within three (03) months upon the completion of the study.

With Best regards

Birhaanuu Qanaatee (Bsc. MPH)
Qindeessaa Garee Qorannoo fi
Qo'annoo Fayyaa Hawwaasaa

Name **Mr Nuredin Yigezu (PI)**

Phone: +251973536637

Email: nyigazu@gmail.com

CC

Mr Andu Berha (PI)

BIIROO FAYYAA OROMIYAA
OROMIA HEALTH BUREAU

Guyyaa Date Lakk Ref.no

Ethical Review Form

Tele: +251118337275 P.O. Box.24341 Addis Ababa, Ethiopia

Criteria/Item	Rating
1. consent form ✓ Does the consent contain all the necessary information that subject should be aware of?	X Yes ____ Requires revision ____ No ____ Not applicable ____ Not attached
2. Are the objectives of the study clearly stated	X Yes ____ No
3. Are provisions to overcome risks well described and accepted? ✓ Justice ✓ Beneficence ✓ Respect for a person	X Yes ____ Not well described ____ No ____ Not applicable
4. Are the safety procedures in the use of vaccines, drugs, and other biological products acceptable?	____ Yes ____ No X Not applicable
5. Are the procedures to keep confidentiality well described?	X Yes ____ No ____ Not applicable
6. Are the proposed researchers competent to carry out the study in a scientifically sound way?	X Yes ____ No ____ Not applicable ____ Unable to assess
7. Does it have material transfer agreement?	____ Yes ____ No X Not applicable
Recommendation	X Approved ____ Approved on condition ____ Not approved

Ethical Clearance Committee Members

Signature of secretory

1. Name: **Abate Zewude**
2. Signature _____

Signature of Chair Person

1. Name: **Birhanu Kenate**
2. Signature: _____

Biiroo Fayyaa Oromiyaatti Daayireektoreetii Hoogganaa B/T/Fayyaa Hawaasa, Qorannoo fi Tajaajila B/Dhiiga
Oromia Health Bureau PHEM, Research and Blood Bank Service Directorate

★ Birhaanuu Qanaatee (Bsc, MPH)
Qindeessaa Garee Qorannoo fi
Qo'annoo Fayyaa Hawwaasaa

Date: 05-May-2025

ADVISORS' RESEARCH PROPOSAL APPROVAL LETTER

This is to certify that we, the undersigned advisors, have thoroughly reviewed and approved the proposal entitled:

"Evaluating the Impact of Electronic Medical Record (EMR) Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency: A Pre-Post Intervention Study at Deder General Hospital, Oromia Region, Eastern Ethiopia."

The proposal was prepared by Mr. Nuredin Yigezu (BSc, MPH) as part of the gap-orientedresearch initiative at Deder General Hospital. We confirm that the research will be conducted in accordance with the approved protocol, and the results will be presented and ready for dissemination to the Oromia Regional Health Bureau Research Ethics Review Board and other relevant stakeholders.We recommend the submission of this proposal to fulfill the ethical and administrative requirements of the Oromia Regional Health Bureau.

Dr. Isak Abdi (MD, Senior)
Major Advisor

Dr. Derese Gosa (GP)
Co-Advisor

Dr. Taju Abdi (MD, Senior)
Co-Advisor

Abdi Tofik (BSc, MPH)
Co-Advisor

Senior Management Team (SMT) Research proposal Approval Sheet

Title of Research:

Evaluating the Impact of Electronic Medical Record Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency: A Pre-Post Study at Deder General Hospital, Oromia Region, Eastern Ethiopia, November 2024

Principal Investigator:

Nuredin Yigezu (BSc, MPH)-CEO

Redwan Sharafuddin-Plan Unit Head

Major advisor:

- Dr. Isak Abdi (MD, Senior)

Co-advisors

- Dr. Taju Abdi (MD, Senior)
- Dr. Derese Gosa (GP)
- Abdi Tofik (BSc, MPH)

Institution:

- **Deder General Hospital, Oromia Region, Eastern Ethiopia**

SMT Research proposal Approval Statement:

We, the undersigned Senior Management Team (SMT) members of Deder General Hospital, have reviewed and approved the above research proposal for implementation in alignment with hospitalpolicies, quality improvement priorities, and ethical standards.

Signatures of SMT Members

Title	Evaluating the Impact of Electronic Medical Record Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency: A Pre-Post Study at Deder General Hospital, Oromia Region, Eastern Ethiopia, November 2024
Principal	**Nuredin Yigezu (BSc, MPH)**

S/N	Name and	Role	Signatures	Date
1.	Abdi Tofik (BSc, MPH)	Quality Director	-Mau-	11-Nov-2024
2.	Abdella Aliyi (BSc MW)	Quality Officer		11-Nov-2024
3.	Mahammad Aliyi (BSc N)	Reform head		11-Nov-20244
4.	Dr. Derese Gosa (GP)	Medical director		11-Nov-20244
5.	Dr Isak Abdi (G/Surgeon)	Staff Representative		11-Nov-2024
6.	Dr. Dawit Seifu (GP)	IPD Director		11-Nov-2024
7.	Hamza Jamal (BSc N)	Metron		11-Nov-2024
8.	Abrahim Tahir (BSc N)	HR Head		11-Nov-2024
9.	Obsa Usma'il (BA)	Finance and		11-Nov-2024
10.	Bellisa Usma'il (BSc Pharm)	Pharmacy head		11-Nov-2024
11.	Alamudin Usma'il (BSc	Laboratory head		11-Nov-2024
12.	Dine Bakar (BA)	Internal Auditor		11-Nov-2024
13.	Redwan Sharafuddin	Planning Head		11-Nov-2024
14.	Nure Jamal (BA)	General service		11-Nov-2024
15.	Mahammad Shamshaddin (BSc)	Qondaala Naamusaa		11-Nov-2024

TABLE OF CONTENTS

LISTS OF TABLES AND FIGURES

1. INTRODUCTION

1.1. Background

The transition from paper-based to electronic medical records (EMRs) is a cornerstone of health system digitization and quality improvement. EMRs enhance data accessibility, reduce documentation errors, improve care coordination, and support health system monitoring and decision-making (Tadesse, Mohammed et al. 2021). Globally, high-income countries have widely adopted EMRs, resulting in improved patient safety, clinical efficiency, and data integrity.

Accurate, timely, and complete health documentation is a cornerstone of high-quality healthcare delivery. It supports clinical decision-making, ensures patient safety, facilitates continuity of care, and enables effective health system management (Kruse, Stein et al. 2018). In low- and middle-income countries (LMICs), however, healthcare facilities often rely on paper-based medical records, which are prone to challenges such as misfiling, loss, illegible handwriting, incomplete data entry, and inefficient retrieval processes (Lau, Price et al. 2012). These limitations not only compromise patient care but also hinder data-driven decision-making at institutional and national levels.

Electronic Medical Records (EMRs) represent a transformative shift in health information management. Defined as digital versions of patients' paper charts within a single healthcare organization, EMRs offer structured data entry, real-time access, automated alerts, and audit trails (Blumenthal and Tavenner 2010). Evidence from high-income countries demonstrates that EMRs improve documentation quality, reduce medical errors, enhance workflow efficiency, and support population health management (Campanella, Lovato et al. 2016).

In Ethiopia, the Federal Ministry of Health (FMOH) has prioritized digital health transformation through initiatives such as the *Information Revolution Roadmap (2016–2020)* and the *Digital Health Strategy 2021–2025 (Taye, Ayele et al. 2021)*. These policies aim to strengthen health information systems and support evidence-based planning. However, implementation has been uneven, with most EMR deployments concentrated in urban centers and vertical programs (e.g., HIV/AIDS, TB), often supported by donor funding.

In Ethiopia, the Federal Ministry of Health (FMOH) launched the Digital Health Strategy (2021–2025) to accelerate the adoption of health information systems, including EMRs, across public health facilities. As part of this initiative, Deder General Hospital—a referral hospital serving over 1.5 million people in East Hararghe Zone began implementing an EMR system in November 2024 with technical and financial support from FMOH and donor partners.

Prior to EMR implementation, the hospital relied entirely on manual, paper-based documentation, which has been associated with frequent file misplacement, illegible handwriting, delayed retrieval, duplication of records, and incomplete documentation factors that compromise patient safety and data quality.

Deder General Hospital, a public facility serving a predominantly rural population in Eastern Ethiopia, has recently initiated a transition from paper-based to electronic medical records. This shift presents a timely opportunity to evaluate the real-world impact of EMRs in a resource-constrained, non-tertiary setting. While anecdotal reports suggest improvements, there is no empirical evidence assessing whether this digital transformation has enhanced the quality, accuracy, and efficiency of health documentation.

1.2. Statement of the Problem

Before EMR implementation, Deder General Hospital faced significant challenges with paper-based documentation, including frequent file loss, illegible handwriting, delayed retrieval, and incomplete records (Li, Peters et al. 2012). These inefficiencies compromised patient safety and data reliability.

The introduction of EMR will be intended to address these issues. However, without baseline and post-implementation data, it will be impossible to determine whether the system achieved its intended outcomes. Furthermore, there will be a lack of context-specific evidence from rural Ethiopian hospitals on EMR impact, limiting institutional learning and policy development (Tadesse, Mohammed et al. 2021).

This study addressed this gap by conducting a rigorous pre-post evaluation to assess changes in documentation practices following EMR implementation

1.3. Rationale for the Study

This study will be timely and strategically important, as it evaluated the EMR system during its early implementation phase. The findings provided actionable evidence for hospital management, informed training and technical support needs, and contributed to the national digital health agenda.

By aligning with the hospital's gap-oriented research mechanism, the study ensured that results would directly inform quality improvement initiatives and future EMR scale-up in similar settings.

1.4. Objectives

1.4.1. General Objective

- To evaluate the impact of EMR implementation on the quality, accuracy, and efficiency of healthcare documentation at Deder General Hospital, Eastern Ethiopia, from **December 5, 2024, to January 5, 2025.**

1.4.2. Specific Objectives

- To assess changes in the accuracy of medical records before and after EMR implementation.
- To evaluate changes in the efficiency of documentation processes.
- To measure healthcare providers' satisfaction and perceived usability of the EMR system.
- To generate context-specific evidence to inform national digital health strategies.

2. LITERATURE REVIEW

2.1. The Global Evolution of Electronic Medical Records (EMRs)

The adoption of Electronic Medical Records (EMRs) marks a fundamental shift in healthcare delivery, moving from fragmented paper records to integrated digital systems. An EMR is a digital repository of a patient's medical history within a single healthcare organization, including diagnoses, medications, treatment plans, immunizations, allergies, and laboratory results (Blumenthal and Tavenner 2010). Unlike Electronic Health Records (EHRs), which are designed for interoperability across institutions, EMRs are typically confined to one facility but still offer significant advantages over paper systems.

Globally, EMR adoption has been driven by policy incentives and growing recognition of their benefits. In the United States, the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 provided substantial financial incentives for healthcare providers to adopt certified EMR systems (Kruse, Stein et al. 2018). By 2015, over 80% of office-based physicians had implemented EMRs, up from just 18% in 2001 (Willett, Kannan et al. 2018). Similar progress will be seen in the United Kingdom's National Health Service (NHS), where EMRs became standard in primary and secondary care (Booth et al., 2019).

These investments will be justified by a robust body of evidence. A systematic review by (Campanella, Lovato et al. 2016) found that EMRs significantly improve the quality of care, including better adherence to clinical guidelines, reduced medication errors, and improved preventive service delivery. For example, computerized physician order entry (CPOE) systems integrated with EMRs reduced adverse drug events by up to 55% (Bates, Leape et al. 1998). EMRs also support public health surveillance and performance measurement by enabling data aggregation and reporting.

2.2. EMRs and Health Documentation: Quality, Accuracy, and Efficiency

The core benefits of EMRs are most evident in three interrelated domains: documentation quality, accuracy, and efficiency.

2.2.1. Quality of Documentation

Documentation quality refers to the completeness, legibility, timeliness, and consistency of medical records. Paper-based systems suffer from inconsistent formatting, missing entries, and poor handwriting, leading to fragmented patient histories (Li, Peters et al. 2012). EMRs address these issues through standardized templates, mandatory fields, and structured data entry.

A study in Massachusetts hospitals found that EMRs increased the completeness of patient histories by 32% and reduced missing lab results by 45% (Wang, Middleton et al. 2003). In Canada, EMRs improved documentation of chronic disease management (e.g., diabetes, hypertension) by ensuring routine recording of key parameters like HbA1c and blood pressure (Lau, Price et al. 2012).

2.2.2. Accuracy of Data

Data accuracy is critical for safe and effective care. In paper systems, transcription errors, duplicate entries, and outdated information are common. EMRs mitigate these risks through automated data capture (e.g., from labs), validation rules, and audit trails.

A U.S. academic medical center found that EMRs reduced medication transcription errors by 60% compared to paper charts (Poon, Keohane et al. 2010). In Australia, EMRs significantly reduced diagnostic errors by providing instant access to prior test results and imaging reports (Elsaid, Truong et al. 2013).

2.2.3. Efficiency of Documentation Processes

Efficiency refers to the time and effort required to document and retrieve information. Paper systems often involve lengthy searches for physical files, slowing clinical workflows.

A meta-analysis by Kruse et al. (2018) found that EMRs reduced chart retrieval time by an average of 7.5 minutes per patient. In emergency departments, EMRs have been shown to reduce patient wait times and improve triage efficiency (Venkatesh, Morris et al. 2003). However, some studies report a "digital drag"—an initial increase in documentation time due to learning curves—highlighting the importance of user-centered design and training (Tran, Rosenbaum et al. 2021).

2.3. Challenges in Low- and Middle-Income Countries (LMICs)

While EMRs are beneficial in high-income settings, their implementation in LMICs faces unique challenges. Sub-Saharan Africa, in particular, contends with unreliable electricity, limited internet connectivity, inadequate technical support, and a shortage of trained personnel (Lau, Price et al. 2012).

A study in rural Kenya found that frequent power outages and slow internet led to system downtimes, forcing staff to revert to paper records (Will be et al., 2010). In Uganda, clinicians resisted EMRs perceived as time-consuming and poorly aligned with workflows (Ssekubugu 2016). These experiences highlight the risk of "technology dumping"—importing systems without adapting them to local contexts.

Cultural and organizational factors also matter. Hierarchical structures and resistance to change can hinder adoption. In Tanzania, nurses and junior doctors often lacked EMR access, limiting their ability to contribute to or retrieve patient data (Muinga 2021). Training gaps further exacerbate these issues.

2.4. EMR Implementation in Ethiopia: Progress and Gaps

Ethiopia has made strides in health system digitization. The FMOH launched the *Information Revolution Roadmap (2016–2020)* to strengthen data-driven decision-making (FMOH, 2020). EMRs have been deployed in HIV/AIDS and TB programs using platforms like OpenMRS, supported by PEPFAR and the Global Fund (Tadesse, Mohammed et al. 2021). These systems improved data completeness and reporting timeliness.

However, progress in horizontal, facility-wide EMR implementation—especially in general hospitals—has been slow. Most studies focus on urban tertiary hospitals. A study in Addis Ababa found moderate improvements in data retrieval time and documentation completeness but noted system instability and poor integration with pharmacy and lab systems (Tadesse, Mohammed et al. 2021).

Crucially, there is very limited evidence from regional and rural hospitals, where the majority of Ethiopians receive care. Deder General Hospital exemplifies this gap. Serving over 1.5 million people, it has only recently begun its digital transition. No rigorous evaluation has been conducted to assess EMR impact on frontline documentation.

A 2022 scoping review identified only 12 EMR impact studies in Ethiopia, most descriptive or program-focused (Tilahun 2022). None used a pre-post design in a general hospital setting. This represents a critical evidence gap.

2.5. Theoretical Frameworks for EMR Success in Resource-Limited Settings

Understanding EMR success requires a socio-technical lens. The Socio-Technical Systems Theory (STST) posits that technology and human systems must be co-designed (Berg 1997). In EMRs, this means aligning system design with local workflows, user needs, and culture.

The Unified Theory of Acceptance and Use of Technology (UTAUT) identifies four determinants of adoption: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, Morris et al. 2003). In Ethiopia, low effort expectancy and weak facilitating conditions may explain low user satisfaction.
(Lau, Price et al. 2012) proposed the Flexible Standards Strategy, advocating adaptable EMR designs. This approach succeeded in Mozambique and Malawi, where open-source EMRs will be customized for maternal and child health.

2.6. Gap-Oriented Justification and Evidence Generation Purpose

This study is designed as gap-oriented research in alignment with Deder General Hospital's mechanism to encourage evidence generation for service improvement. Routine audits and HMIS reports have consistently revealed major challenges with paper-based documentation, including incomplete records, data inaccuracy, duplication, and inefficiencies in record retrieval. To address these gaps, the hospital has recently implemented an Electronic Medical Record (EMR) system; however, there is limited evidence on its actual impact on documentation practices. By evaluating documentation quality, accuracy, and efficiency before and after EMR implementation, this study directly addresses a priority service gap and generates actionable evidence. The findings will be disseminated through the hospital's Research and Quality Committee and integrated into ongoing quality improvement initiatives, guiding decisions on scaling, training, and process redesign. This ensures that the research not only fills a knowledge gap but also contributes directly to strengthening evidence-based practice and healthcare delivery at Deder General Hospital.

2.7. Conceptual Framework

This conceptual framework provides a strong theoretical foundation for your study, clearly linking upstream policy factors to frontline outcomes, and aligns perfectly with the gap-oriented, systems-level approach expected in public health and health informatics research.

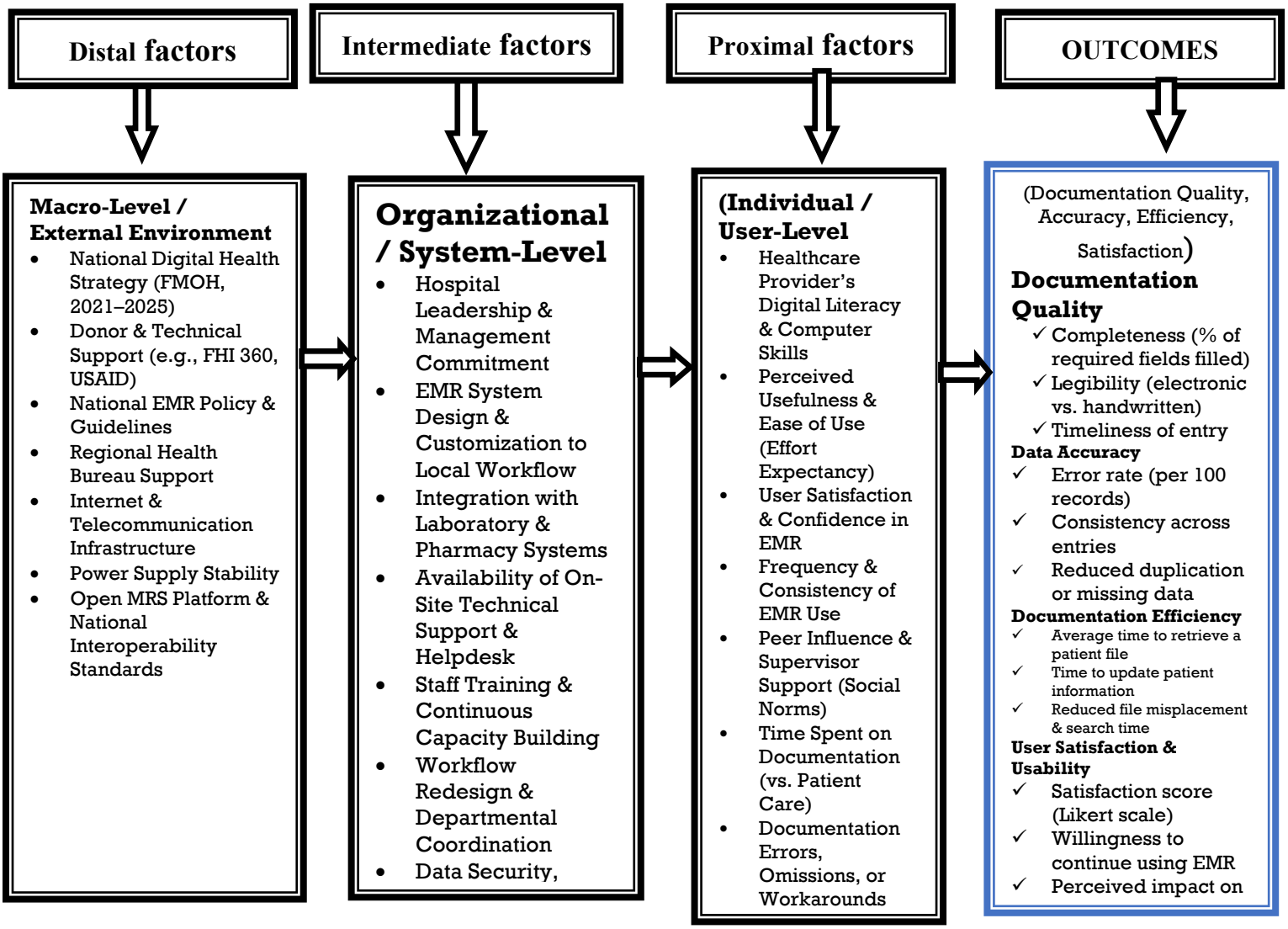

Figure 1: *Conceptual Framework Showing the Influence of Factors on the Impact of EMR Implementation on Documentation Quality, Accuracy, and Efficiency (Adapted from Socio-Technical Systems Theory and DeLone & McLean Model, 2003).*

3. METHODOLOGY

3.1. Study Setting and period

The study will be conducted at Deder General Hospital, a public hospital in East Hararghe Zone, Oromia Region. The hospital provides services in internal medicine, surgery, pediatrics, obstetrics and gynecology, and emergency care. It serves over 1.5 million people and has 120 inpatient beds and over 134,500 annual patient visits. the study will be conducted from December 5, 2024, to January 5, 2025.

3.2. Study Design

An institutional-based **pre-post interventional study design** will be used to compare documentation indicators before and after EMR implementation.

3.3 Study Population

- The study population encompasses all individuals and records relevant to the evaluation of Electronic Medical Record (EMR) implementation at Deder General Hospital.
- It is **divided into two main components**: **(1) patient medical records** used for documentation audit, **and** (2) healthcare providers **involved in clinical documentation** and EMR utilization.

3.4. Target Population

- **All patient records** from the Outpatient Department (OPD), Inpatient Department (IPD), and Emergency Department (EMER) at Deder General Hospital during the pre-EMR (November 2023 – October 2024) and post-EMR (November 2024 – January 2025) periods.
- **All clinical and supportive healthcare providers**—including physicians, nurses, midwives, interns/entry-level service officers (IESO), laboratory technicians, pharmacists, and EMR data clerks—who are actively involved in patient documentation and have used the EMR system following its implementation.

3.5. Source Population

The **source population** is the **actual pool** from which the **sample will be drawn**.

- **For patient records, this includes**:
  - ✓ All archived paper-based records from the pre-EMR period stored in the hospital's medical archive.
  - ✓ All digitized patient records generated through the EMR system during the first two months of implementation (November–December 2024 and January 2025).
- **For healthcare providers, the source population consists of:**
  - ✓ All clinical staff currently employed at Deder General Hospital who participated in patient documentation and received EMR training.
  - ✓ Staff rosters from each department (OPD, IPD, EMER, Laboratory, Pharmacy, etc.) served as the sampling frame.

3.6. Sample Size and Sampling Technique

Sample size calculated using formula for single population proportion (p=0.5, d=0.05) yielding n=384. Increased to 300 per group for paired analysis with a 10% buffer, leading to 334 records pulled per period.

The sample size will be calculated using the standard formula for estimating a **single population proportion:** $n = \frac{Zx^2.P.\{1-P)}{dx^2}$

Where:

- **Z**=1.96 (Z-value for 95% confidence level)
- **p**=0.5 (assumed proportion for maximum variability, due to lack of local baseline data)
- **d**=0.05 (margin of error)
  - $n = \frac{(1.96)x^2.0.5.\{1-0.5)}{(0.5)x^2}$=384.16≈**384**

Sample Size Justification:

The sample size for the patient record audit will be calculated to ensure adequate power for detecting a statistically significant difference in the primary outcome, "documentation completeness," between the pre- and post-EMR periods.

While an initial calculation for estimating a single proportion (using p=0.5 for maximum variability, 95% CI, 5% margin of error) yielded a sample of 384, the study design employs a paired comparison (pre vs. post). For paired analyses, the effective sample size is the number of pairs (n=300). A sample size of 300 pairs provides >99% power to detect the observed 61.7% absolute increase in completeness (from 30% to 91.7%) at a significance level of α=0.05, assuming a conservative correlation between pre- and post-measurements. This confirms that n=300 per period is not only adequate but highly powill bed for the primary analysis.

To account for potential unusable records (e.g., missing, incomplete, illegible), a 10% buffer will be applied. Therefore, 334 records will be initially selected for each period (Pre-EMR and Post-EMR) using systematic random sampling. After screening, the first 300 fully usable records from each period will be included in the final analysis, ensuring a robust paired dataset.

Proportional Distribution Across Departments

The 300 usable records will be distributed across three departments based on the hospital's annual patient visit data:

Department	Annual Patient Visits	% of Total	Sample (n)	Pre-EMR (n)	Post-EMR (n)
OPD	73,975	55%	330	165	165
IPD	40,350	30%	180	90	90
Emergency	20,175	15%	90	45	45
Total	134,500	100%	300	300	300

The number of eligible records per period will be estimated as:

- **OPD: ~**36,988 (pre), ~36,988 (post)
- **IPD: ~**20,175 (pre), ~20,175 (post)
- **Emergency:** ~10,088 (pre), ~10,088 (post)

To account for the 10% non-usable rate, the initial number of records selected per department and period will be:

Department	Usable (n)	Initial Selection (n)
OPD	165	165 ÷ 0.9 ≈ 184
IPD	90	90 ÷ 0.9 = 100
Emergency	45	45 ÷ 0.9 = 50
Total per period	**300**	**334**

→ **A total of 668 records will be initially pulled (334 pre-EMR and 334 post-EMR).**

3.6.1. Sampling Technique

Systematic random sampling will be used to select patient records from each department and time period.

The sampling interval **(*k*)** will be calculated as: $k = \frac{N}{nselected}$

Where**:**

- ***N*** **=** Total number of eligible patient records in the department and time period
- n_{selected}**= number of records to be initially selected (including buffer)**

Examples:

- **OPD (pre-EMR):**

  k= $\frac{36{,}988}{184} \approx 201 \rightarrow k = 200$ $(rounded\ for\ practicality)$

- **IPD (post-EMR):**

  k= $\frac{20{,}175}{100} \approx 202 \rightarrow k = 200$

- **Emergency (pre-EMR):**

  k= $\frac{10{,}088}{50} \approx 202 \rightarrow k = 200$

A random starting point between **1 and k** will be selected using a random number generator. **Every** k^{th} record will be pulled from the patient registration log, medical archive (pre-EMR), or EMR audit trail (post-EMR).

Selected records will be screened for completeness. If a record will be incomplete, missing, or illegible, the next sequential record will be included until the target of **300 usable records per period** will be achieved.

B. Healthcare Staff Interviews (n = 100, Post-EMR Only)

Here is the completed table based on the provided data, using proportional stratified sampling to allocate 100 participants from a total of 165 staff members. The sample size for each category is calculated as:

$$k = \frac{Total\ staff\ in\ category}{Sample\ size\ for\ category}$$

every **k^{th} staff** member will be invited to participate

Sampling Frame and Stratification

The sampling frame will be derived from the hospital's staffing roster, which includes 150 clinical and supportive staff involved in documentation. The sample will be **stratified by professional category** to ensure representation of key user groups:

The sample will be stratified by Professional Category based on role relevance and updated staffing priorities:

Professional Category	**Approx. Staff (#)**	**Proportion (%)**	**Sample (n=100)**
Nurses	80	48.5%	49
Midwives	25	15.2%	15
IESO	2	1.2%	1
Physicians	9	5.5%	6
Lab Technicians	10	6.1%	6
Pharmacists	22	13.3%	13
EMR Data Clerks	7	4.2%	4
Administrative staff	10	6.1%	6
Total	165	100%	100

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

- Healthcare providers involved in documentation
- Patient records from **November 2023–Oct 2024 (pre) and Nov 2024–Jan 2025 (post)**
- Willingness to participate and provide consent

3.5.2. Exclusion Criteria

- Temporary or non-clinical staff
- Incomplete or missing records
- Refusal to participate

3.6. Variables of the study

3.6.1. Dependent Variables / Outcome Variables

These are the primary outcomes being measured to evaluate the impact of EMR implementation.

- Data Quality
- Data Accuracy
- Documentation Efficiency
- User Satisfaction and Perceived Usability

3.6.2. Independent variables

- EMR Implementation (Pre vs. Post),
- National Policy,
- Donor Support,
- Infrastructure (Power, Internet),
- Leadership Commitment,
- System Design,
- Integration,
- Training,
- Technical Support,
- Provider Skills,
- User Perceptions,
- Workflow Factors

3.7. Operational Definitions

- **Completeness**: Proportion of mandatory fields present and filled per record, using the study's WHO-based audit checklist.
  - Formula: (Number of mandatory fields correctly filled ÷ Total mandatory fields) × 100.
  - Classification:
    - Complete = ≥90%",
    - Partially complete= 80–89%
    - Incomplete =<80%
- **Legibility**: Binary for paper era (all required items clearly readable without guesswork = 1; otherwise = 0).
  - In EMR era, legibility is assumed "1" if generated by EMR interface/printout.
  - Reported separately and within the composite.
- **Timeliness of entry:** Time from clinical **encounter end to documentation completion/closure** in the record **(minutes/hours), from timestamps, signature dates**, **or EMR audit** trail where available.
  - *On-time* = completed the same day;
  - *delayed* = completed after calendar day of encounter.
- **Accuracy rate per record:** Proportion of audited items whose values exactly match source evidence (orders, labs, vitals, meds) or are internally consistent across entries.
  - *Formula:* (Accurate items/Audited items) × 100.

- **Error rate** is the complement, reported as **errors per 100 records** and **% inaccurate items**. Errors include transcription mismatches, wrong patient, duplicated entries, or contradictory data. Assessed with manual comparison and EMR logs where feasible.
- **Entry/update time per encounter**: Minutes spent by the provider to complete required documentation for that visit/admission (from first entry to final save/sign).
- **File misplacement rate (paper only) / "record not found" event rate:**
    - For **paper = (**Number of requests where the correct record is **unavailable within 10 minutes** /Total requests)100 requests.
    - For EMR, "record not found" includes failed lookups due to duplicate MRNs or mis-linkage.

Satisfaction score:

User satisfaction and perceived usability will be assessed using a structured, interviewer-administered questionnaire (see Appendix, S2 Part 2) administered to 100 healthcare providers in the **post-EMR period**. **The tool included 7 core** items measured on a **5-point Likert scale:**

Item	**Likert Scale**
The EMR system is easy to use.	1 = Strongly Disagree → 5 = Strongly Agree
The EMR saves time in documentation.	1 → 5
The EMR improves the quality of patient records.	1 → 5
I receive adequate technical support when facing EMR issues.	1 → 5
The system is reliable (rarely crashes or freezes).	1 → 5
I am satisfied with the EMR system overall.	1 → 5
I would recommend EMR use in other hospitals.	Yes/No converted to 1 (No) or 5 (Yes) for scoring consistency

Note: Item 52 (recommendation) is **binary** but will be assigned numerical values **(Yes** = 5, **No** = 1, Not Sure = 3) to maintain scale alignment.

2. Scoring Procedure

Step 1: Assign Numerical Values

Each response is assigned a numerical value:

- Strongly Disagree = 1
- Disagree = 2
- Neutral = 3
- Agree = 4
- Strongly Agree = 5

For binary items (e.g., "Yes/No"), values are mapped:

- Yes = 5
- No = 1
- Not Sure = 3 (treated as neutral)

Step 2: Calculate Individual Score

For each respondent, the total score is calculated by summing responses across the 7 items.

- Maximum possible score = 7 × 5 = 35
- Minimum possible score = 7 × 1 = 7

Step 3: Compute Mean Satisfaction Score

The **overall User Satisfaction** and Perceived Usability Score is expressed as the mean **Likert score per item**, calculated as:

$$Mean\ Satisfaction\ Score = \frac{Sum\ of\ all\ responses\ for\ all\ participants}{Number\ of\ participants * Number\ of\ items}$$

OR

$$Mean\ Score = \frac{Total\ Score\ across\ all\ \ respondents}{Total\ possible\ Maximum\ score}$$

3. Categorization (Optional)

To facilitate interpretation, responses can be categorized:

Mean Score Range	Interpretation
4.5 – 5.0	Very High Satisfaction
3.5 – 4.4	High Satisfaction
2.5 – 3.4	Moderate Satisfaction
1.5 – 2.4	Low Satisfaction
1.0 – 1.4	Very Low Satisfaction

5. Additional Indicators (Supporting Usability Assessment)

Beyond the mean score, the following indicators will be used to assess Perceived Usability:

Percentage of users who agree/strongly agree with key usability statements.

Proportion willing to recommend EMR to other hospitals.

Metric	Formula / Method	Interpretation
User Satisfaction Score	Mean of 7 Likert-scale items (1–5)	Higher = more satisfaction
Overall Mean Score	Total score ÷ (N × 7)	e.g., 4.2/5 = high satisfaction
Satisfaction Rate	% of respondents who "Agree" or "Strongly Agree" with overall satisfaction item	e.g., 87.3% satisfied
Recommendation Rate	% who answill bed "Yes" to recommending EMR	Indicator of system acceptance

3.8. Data Collection Methods

3.8.1 Data Collection Tools/Instruments

The study employed multiple tools to capture both quantitative and qualitative data.

- **Structured Checklist**: Developed from different EMR evaluation tools to audit 600 patient records (300 pre-EMR and 300 post-EMR). The checklist assessed documentation completeness, accuracy, timeliness, legibility, and error management.
- **Structured Questionnaire**: Developed for 100 healthcare providers to measure efficiency of documentation processes, workflow impact, and user satisfaction. Items will be designed using a 5-point Likert scale and yes/no responses. The questionnaire's internal consistency will be tested using Cronbach's Alpha **(≥0.70** considered acceptable).
- **Semi-structured Interview Guide**: Used to explore deeper insights on user experiences, challenges, and perceived usability of the EMR system.
- **Direct Observation Tool**: Designed to objectively assess documentation processes in selected departments, focusing on retrieval time, record updating, and error correction mechanisms.

The tools will be initially prepared in English, translated into Afaan Oromo for clarity, and back-translated to English to ensure consistency.

3.8.2 Data Collectors

Data will be collected by six trained professionals (four BSc Nurses and two Midwives) with prior experience in research and EMR operations. One MPH-level health professional served as a supervisor. All will be trained for two days on study objectives, data collection procedures, and ethical considerations.

3.8.3 Data Collection Procedures

- **Record Audit**: Patient records will be systematically reviewed using the structured checklist to capture completeness, accuracy, and timeliness indicators. Pre-EMR records will be extracted from paper charts, while post-EMR records will be obtained from the hospital EMR database.
- **Provider Survey:** The structured questionnaire will be administered to healthcare providers after EMR implementation.
- **Interviews and Observations**: Semi-structured interviews will be conducted with selected providers, and direct observations will be carried out in OPD, inpatient, and emergency departments to triangulate findings.

To maintain consistency, daily supervision and random spot-checks will be conducted. Completed tools will be checked for completeness at the end of each day, and feedback will be provided to data collectors immediately.

3.9. Data Management and Quality Assurance

3.9.1 Pre-testing of Tools

The structured checklist and questionnaires will be pre-tested on 5% of the sample size at nearby Haramaya District Hospital, which had not yet implemented an EMR system. Necessary modifications will be made to improve clarity, relevance, and logical flow of questions.

3.9.2 Training of Data Collectors

All data collectors and the supervisor participated in a two-day intensive training. The training focused on the objectives of the study, definitions of variables, data collection procedures, confidentiality, and ethical conduct. Practical sessions, including role-play and mock interviews, will be conducted to ensure uniform understanding.

3.9.3 Supervision and Monitoring

Daily supervision will be provided by the principal investigator and the assigned supervisor. Spot checks will be conducted on 10% of the completed tools each day.

Feedback will be immediately given to data collectors to minimize errors and inconsistencies.

3.9.4 Data Entry and Verification

Data will be double-entered into **EpiData** to minimize entry errors, then exported to SPSS version 27 for analysis. Consistency checks, frequency runs, and cross-tabulations will be performed to identify missing values, outliers, and logical inconsistencies.

3.9.5 Reliability and Validity Checks

- **Internal Consistency:** The **internal consistency** of the **7-item user satisfaction** questionnaire will be assessed using **Cronbach's Alpha coefficient**. A value of **$\alpha \geq 0.70$** will be **considered acceptable.** The final calculated **Cronbach's Alpha** will be **0.82**, indicating **good internal reliability.**
- **Inter-Rater Reliability:** To ensure consistency in the patient record audit, two data collectors independently reviewed a random sample of 30 records (10% of the final sample) using the structured checklist prior to the main data collection. **Inter-rater** agreement will be quantified using **Cohen's Kappa (κ) statistic**. **A κ value > 0.60** indicates **substantial agreement**. The **final calculated Kappa statistic** will be **0.85**, indicating **excellent agreement**. Any discrepancies will be discussed and resolved by consensus before proceeding.
- **Construct Validity:** The **content validity** of the audit checklist will be ensured by aligning its items with the WHO guidelines for health record documentation and the Ethiopian Federal Ministry of Health's digital health standards. **Face validity** will be established through expert review by the study advisors

3.9.6 Data Security and Confidentiality

All hardcopy checklists and questionnaires will be stored in a locked cabinet accessible only to the research team. Electronic data will be password-protected, and personal identifiers will be excluded from the dataset before analysis.

3.10 Data Analysis

3.10.1 Data Preparation

After double entry in EpiData and verification, the dataset will be exported to SPSS version 26 for statistical analysis. Prior to analysis, the dataset will be cleaned by checking for missing values, outliers, and logical inconsistencies. Descriptive statistics will be computed to summarize the characteristics of the study population and the main study variables.

3.10.2 Descriptive Analysis

- Socio-demographic and professional characteristics of healthcare providers will be described using frequencies, percentages, means, and standard deviations.
- Documentation completeness, accuracy, and efficiency indicators will be summarized using proportions, means, and confidence intervals.
- User satisfaction and perceived usability scores will be summarized using means, medians, and interquartile ranges (IQRs), with results presented in tables and graphs.

3.10.3 Inferential Analysis

Data analysis will be performed using SPSS version 27. The following statistical tests will be employed, with a significance level **set at $p < 0.05$.**

1. **Pre-Post Comparisons (Paired Data):**
   - **Continuous Variables** ***(e.g., Time to retrieve record, Avg. errors per 100 records)*****:** **Paired t-tests** will be used. The assumption of normality for the differences (post-Pre) will be assessed using the **Shapiro-Wilk test** and visual inspection of **Q-Q plots**. Where this assumption will be violated, the non-parametric **Wilcoxon Signed-Rank Test** will be applied as a **sensitivity analysis** to confirm results.
   - **Categorical Variables** ***(e.g., Completeness: Yes/No, Legibility: Yes/No):*** **McNemar's Test** will be used to assess changes in proportions for paired data.

- **Ordinal Categorical Variables (*e.g., Reports produced on time: Always/Sometimes/Never)***: The **Marginal Homogeneity** Test will be used.

2. **User Satisfaction Analysis:**
   - **Differences in mean satisfaction** scores across professional categories will be assessed using **One-way Analysis of Variance (ANOVA**). The assumptions of normality (Shapiro-Wilk test on residuals) and homogeneity of variances (Levene's Test) will be checked. If assumptions will be violated, the non-parametric **Kruskal-Wallis H Test** will be used.
   - For post-hoc pairwise comparisons following a significant ANOVA, Tu**key's Honestly Significant Difference (HSD) test** will be applied to control for family-wise error. Following a significant Kruskal-Wallis test, Dunn's test with Bonferroni correction will be used.
3. **Factors Associated with Outcomes:**
   - Binary Logistic Regression will be used to identify factors associated with binary outcomes (e.g., Complete: Yes/No, Error present: Yes/No). For continuous outcomes (e.g., Time to retrieve record), Linear Regression will be employed.
   - Variable selection for **multivariable models** followed an exploratory approach: all variables with a **p-value < 0.25** in the **initial bivariable analysis** will be considered for inclusion in the **multivariable model** to avoid overlooking potential confounders.
   - **Model fit** will be assessed using the **Hosmer-Lemeshow test for logistic regression** and R-**squared for linear regression**. **Multicollinearity among predictors** will be evaluated using the **Variance Inflation Factor (VIF),** with **VIF > 5** indicating potential issues.
   - **Effect sizes** are reported alongside **p-values**: Adjusted Odds Ratios **(AOR)** for **logistic regression**, **Beta coefficients** for **linear regression,** and **Cohen's d for paired t-tests.**
4. **Reporting:** Exact p-values are reported (e.g., p=0.003) wherever possible, except when **p<0.001**.

3.11. Ethical Considerations

3.11.1 Ethical Approval

Ethical clearance will be obtained Ethical approval will be obtained from Oromia Regional Health Bureau Research Ethics Review Board (IRB). Official permission letters will be also secured from the Oromia Regional Health Bureau and the management of Deder General Hospital prior to data collection.

3.11.2 Informed Consent

- For the patient record audit, individual consent will be not required since no personal identifiers will be recorded; instead, institutional approval will be granted.
- For the healthcare provider survey and interviews, written informed consent will be obtained from each participant after providing detailed information on the purpose, procedures, benefits, and potential risks of the study. Participation will be entirely voluntary, and participants will be informed that they could withdraw at any stage without consequences.

3.11.3 Confidentiality and Anonymity

- All collected data will be kept strictly confidential. Patient identifiers (name, card number) will be excluded from the checklist and replaced with anonymous codes.
- Healthcare providers' survey responses will be anonymized, and no identifying information will be linked to individual responses.

- Hard copy data collection tools will be stored in locked cabinets, and electronic datasets will be password-protected and accessible only to the research team.

3.11.4 Risk-Benefit Consideration

The study posed minimal risk to participants, as it involved reviewing medical records and collecting non-invasive survey data. The potential benefit will be the generation of context-specific evidence to improve healthcare documentation practices and strengthen the EMR system at Deder General Hospital.

3.11.5 Dissemination of Findings

The results will be shared with Deder General Hospital management, the Oromia Regional Health Bureau, and the Ethiopian Federal Ministry of Health. Findings will also be disseminated through academic publications and conferences to support evidence- based decision-making and national digital health strategies.

4. EXPECTED OUTCOMES

- Significant improvement in data completeness and legibility post-EMR.
- Reduction in documentation error rates and file misplacement.
- Decreased time for record retrieval and updating.
- Higher healthcare provider satisfaction and perceived usability.

5. WORK PLAN

Table 1: *Work plan to Evaluating the Impact of Electronic Medical Record Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency at Deder General Hospital, Oromia Region, Eastern Ethiopia, from November 01-30, 2024*

S. No	Activity	Responsible	24-Nov	24-Dec	25-Jan	25-Feb	25-Mar	25-Apr	25-May	25-Jun
1	Proposal Finalization	PI	✓							
2	Ethical Approval	PI		✓	✓					
3	Tool Development & Pretest	PI, Advisor		✓						
4	Pre-Data Collection	PI, DC			✓					
5	Post-Data Collection	PI, DC				✓	✓			
6	Data Entry & Analysis	PI						✓	✓	
7	Report Writing	PI							✓	✓
8	Thesis Submission & Defense	PI								✓
9	Dissemination	PI								✓

PI: Principal Investigator, **DC**: Data Collector

1. BUDGET BREAKDOWN (ETB)

Table 2: Budget required for Evaluating the Impact of Electronic Medical Record Implementation on Healthcare Documentation Quality, Accuracy, and Efficiency at Deder General Hospital, Oromia Region, Eastern Ethiopia, from November 01-30, 2024.

Item	**Description**	**Quantity**	**Unit Cost (ETB)**	**Total (ETB)**
Personnel				
PI Honorarium	6 months	6	3,000	18,000
Research Assistants	4 staff × 4 months	16	4,000	64,000
Data Analyst	1 month	1	5,000	5,000
Training	Workshop, materials, refreshments	30 staff	600	18,000
Data Tools	Printing, checklists, stationery	500 pages	25	12,500
Tablets (rental)	4 units × 3 months	12	1,500	18,000
Wi-Fi Router	4 months	1	10,000	10,000
Software License	STATA/SPSS	1	5,000	5,000
Reporting & Dissemination	Printing, USBs, workshop			19,000
Contingency (5%)				13,970
TOTAL				

6. REFERENCES

Bates, D. W., et al. (1998). "Effect of computerized physician order entry and a team intervention on prevention of serious medication errors." Jama **280**(15): 1311-1316.

Berg, M. (1997). "Of forms, containers, and the electronic medical record: Some tools for a sociology of the formal." Science, Technology, & Human Values, **22(4)**.

Blumenthal, D. and M. Tavenner (2010). "The “meaningful use” regulation for electronic health records." New England Journal of Medicine **363**(6): 501-504.

Campanella, P., et al. (2016). "The impact of electronic health records on healthcare quality: a systematic review and meta-analysis." **26**(1): 60-64.

Elsaid, K., et al. (2013). "Impact of electronic chemotherapy order forms on prescribing errors at an urban medical center: results from an interrupted time-series analysis." International journal for quality in health care **25**(6): 656-663.

Kruse, C. S., et al. (2018). "The use of electronic health records to support population health: a systematic review of the literature." **42**(11): 214.

Lau, F., et al. (2012). "Impact of electronic medical record on physician practice in office settings: a systematic review." BMC medical informatics and decision making **12**(1): 10.

Li, C., et al. (2012). "The consequences of information technology control weaknesses on management information systems: The case of Sarbanes-Oxley internal control reports." Mis Quarterly: 179-203.

Muinga, N., Mars, M., & English, M. (2021). "Barriers to electronic health record adoption in a resource-limited setting: A qualitative study of healthcare providers’ perspectives in Kenya." BMC Health Services Research **21**: 1-10.

Poon, E. G., et al. (2010). "Effect of bar-code technology on the safety of medication administration." New England Journal of Medicine **362**(18): 1698-1707.

Ssekubugu, R., Musiime, V., Kayiwa, J., & Nabirye, R. C (2016). "Barriers to the implementation of electronic medical records in Uganda: A cross-sectional survey of healthcare workers." BMC medical informatics and decision making **16**: 1-9.

Tadesse, A. W., et al. (2021). "Evaluation of implementation and effectiveness of digital adherence technology with differentiated care to support tuberculosis treatment adherence and improve treatment outcomes in Ethiopia: a study protocol for a cluster randomised trial." BMC infectious diseases **21**(1): 1149.

Taye, G., et al. (2021). "The Ethiopian Health Information System: where are we? And where are we going?" The Ethiopian Journal of Health Development **35**(1).

Tilahun, B., Zegeye, D., & Assefa, T. (2022). "Digital health interventions in Ethiopia: A scoping review." Journal of medical systems **46**.

Tran, B. D., et al. (2021). "An interview study with medical scribes on how their work may alleviate clinician burnout through delegated health IT tasks." Journal of the American Medical Informatics Association **28**(5): 907-914.

Venkatesh, V., et al. (2003). "User acceptance of information technology: Toward a unified view." Mis Quarterly: 425-478.

Wang, S. J., et al. (2003). "A cost-benefit analysis of electronic medical records in primary care." The American journal of medicine **114**(5): 397-403.

Willett, D. L., et al. (2018). "SNOMED CT concept hierarchies for sharing definitions of clinical conditions using electronic health record data." Applied clinical informatics **9**(03): 667-682.

7. APPENDIX

APPENDIX 1: DATA COLLECTION TOOLS

Section 1: Part 1: Patient Record Audit Checklist

MRN: _____

S.No	Documentation Indicator	Pre-EMR	Post-EMR
1.	Is patient name recorded?	☐ Yes ☐ No	☐ Yes ☐ No
2.	Is patient medical record number present?	☐ Yes ☐ No	☐ Yes ☐ No
3.	Is date of service recorded?	☐ Yes ☐ No	☐ Yes ☐ No
4.	Is diagnosis clearly documented?	☐ Yes ☐ No	☐ Yes ☐ No
5.	Is treatment plan recorded?	☐ Yes ☐ No	☐ Yes ☐ No
6.	Are prescribed medications complete (drug name, dose, frequency, duration)?	☐ Yes ☐ No	☐ Yes ☐ No
7.	Is handwriting legible? (Pre-EMR only)	☐ Yes ☐ No	N/A
8.	Are all required fields completed (e.g., vital signs, allergies, lab results)?	☐ Yes ☐ No	☐ Yes ☐ No
9.	Is there evidence of duplicate entries?	☐ Yes ☐ No	☐ Yes ☐ No

10.	Is there evidence of missing pages or lost files?	☐ Yes ☐ No	☐ Yes ☐ No
11.	Time to retrieve the patient record (minutes)	_____ min	_____ min
12.	Time to update the record after consultation (minutes)	_____ min	_____ min

Section 1: Part 2: Documentation Quality and Accuracy (Pre-EMR vs Post-EMR)

MRN: _____

Domain	Indicator / Question	Pre-EMR	Post-EMR
Completeness	13. Are all demographic fields (name, age, sex, address) filled in each record?	☐ Yes ☐ No	☐ Yes ☐ No
	14. Is the presenting complaint/diagnosis documented in every patient record?	☐ Yes ☐ No	☐ Yes ☐ No
	15. Are investigation and treatment details recorded?	☐ Yes ☐ No	☐ Yes ☐ No
	16. Are referral or follow-up details recorded when applicable?	☐ Yes ☐ No	☐ Yes ☐ No
Accuracy	17. Do patient records match other source documents (e.g., referral slip, lab report, prescription)?	☐ Yes ☐ No	☐ Yes ☐ No
	18. Are dates and times recorded correctly?	☐ Yes ☐ No	☐ Yes ☐ No
	19. Number of errors (e.g., missing info, wrong entry, illegible writing, wrong patient ID) per 10 records	____	____
	20. How are corrections handled? (Cross-out / Rewrite / EMR Audit Trail / Other)	____	____

Legibility / Clarity	21. Are records legible and understandable (paper) or clearly entered (EMR)?	☐ Yes ☐ No	☐ Yes ☐ No
	22. Is standard terminology used consistently (diagnosis, abbreviations, coding)?	☐ Yes ☐ No	☐ Yes ☐ No
Data Consistency	23. Do patient identifiers (ID, name, DOB) match across different service areas?	☐ Yes ☐ No	☐ Yes ☐ No
	24. Number of duplicate patient records found per month	_____	_____

Section 1: Part 3: Documentation Efficiency Comparison Tool (Pre-EMR vs Post-EMR)
MRN: _____

Domain	Indicator	Pre-EMR	Post-EMR
Time Efficiency	25. Avg. time to complete one patient record (minutes)	_____	_____
	26. Avg. time to retrieve past patient record (minutes)	_____	_____
	27. Avg. time to complete referral/transfer documentation (minutes)	_____	_____
Workflow Efficiency	28. Duplication of data entry per patient visit (times)	_____	_____
	29. Patient information accessible across all service areas (Yes/No)	☐ Yes ☐ No	☐ Yes ☐ No
	30. Continuity of patient data maintained (Yes/No)	☐ Yes ☐ No	☐ Yes ☐ No
Error & Correction Efficiency	31. Avg. errors per 10 patient records	_____	_____
	32. Method of corrections (Cross-out / Rewrite / EMR Audit Trail / Other)	_____	_____
	33. Duplicate patient records created per month	_____	_____
	34. Time to prepare routine report (hours)	_____	_____

Reporting & Feedback Efficiency	35. Reporting process automated (Yes/No)	☐ Yes ☐ No	☐ Yes ☐ No
	36. Reports produced on time (Always / Sometimes / Never)	☐ Always ☐ Sometimes ☐ Never	☐ Always ☐ Sometimes ☐ Never

Section 2: Healthcare Provider Survey Questionnaire

Respondent No: _____

Section 2: Part 1: Socio-Demographic and Professional Characteristics

S.No	Question	Response
37.	Age	_____ years
38.	Gender	☐ Male ☐ Female
39.	Profession	☐ Doctor ☐ IESO ☐ Nurse ☐ Midwife ☐ Lab ☐ Pharmacy ☐ Other: _____
40.	Department	☐ OPD ☐ IPD ☐ Maternity ☐ Pediatrics ☐ Laboratory ☐ Pharmacy ☐ Psychiatry ☐ Ophthalmology ☐ Other: _____
41.	Years of clinical experience	_____ years
42.	Highest educational qualification	☐ Diploma ☐ Degree ☐ Masters ☐ Doctor ☐ Other: _____

43.	Have you received EMR training?	☐ Yes ☐ No
44.	If yes, how many hours of training did you receive?	_____ hours
45.	How long have you been using the EMR system?	☐ <1 month ☐ 1–3 months ☐ >3 months

Section 2: Part 2: EMR Usability and User Satisfaction (Post-EMR Only)

S.No	Question	Response (1–5 Likert Scale)
46.	The EMR system is easy to use.	☐ 1 (Strongly Disagree) ☐ 2 ☐ 3 ☐ 4 ☐ 5 (Strongly Agree)
47.	The EMR saves time in documentation.	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
48.	The EMR improves the quality of patient records.	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
49.	I receive adequate technical support when facing EMR issues.	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
50.	The system is reliable (rarely crashes or freezes).	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
51.	I am satisfied with the EMR system overall.	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
52.	I would recommend EMR use in other hospitals.	☐ Yes ☐ No ☐ Not Sure

https://kf.kobotoolbox.org/#/forms/a3MSKcVfr98XRtVqTCyynd

https://kf.kobotoolbox.org/#/forms/arvrMkHk86kxLas7mTX3te