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Prescription Error and Intervention Outcome in Zewditu Memorial Hospital, Addis Ababa, Ethiopia, in 2023

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Abstract:

Objective: This research study aimed to investigate prescription errors and their intervention outcomes at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, during the year 2023. The study assessed the prevalence of prescription errors, identified contributing factors, evaluated the effectiveness of medication safety interventions, and examined the impact of adverse drug events on patient outcomes and healthcare costs.

Methods: A cross-sectional study design was employed, and data were collected from the hospital's prescription files. Prescription errors were classified into various categories, and the frequency and proportion of errors were calculated. The study also evaluated different medication safety interventions' effectiveness in reducing prescription errors and assessed healthcare professionals' adherence to medication safety protocols. Additionally, the study conducted a cost analysis of adverse drug events to assess their financial implications.

Results: The study revealed a prescription error rate of 25.1%, with wrong dosage, drug omission, drug-drug interactions, and illegible prescriptions being the most common error categories. Adverse drug events resulting from prescription errors affected 12.2% of patients, leading to patient harm and increased healthcare utilization. The electronic prescribing system emerged as the most effective intervention, reducing prescription errors by 60.1%. High adherence rates were observed for double-checking high-risk medications and conducting medication safety huddles. However, there was room for improvement in implementing barcoding technology and tall man lettering.

Conclusion: Prescription errors and adverse drug events pose significant challenges to medication safety at Zewditu Memorial Hospital. Implementing electronic prescribing systems and enhancing medication reconciliation processes can significantly reduce prescription errors and improve patient outcomes. Furthermore, fostering a culture of safety, promoting interprofessional collaboration, and investing in education and training programs are essential to enhance medication safety practices. Continuous quality improvement initiatives and regular audits should be conducted to address medication safety challenges and support a culture of learning from errors. Policymakers should be engaged to support medication safety initiatives, and multi-center studies are recommended to enhance generalizability.

Keywords: Prescription errors, Medication safety, Adverse drug events, Healthcare utilization, Electronic prescribing system, Medication reconciliation, Inter-professional collaboration, Medication safety protocols, Patient outcomes, Cost analysis.

Introduction

Background

Prescription errors are a persistent concern in healthcare systems worldwide, posing risks to patient safety and resulting in substantial healthcare burdens. In Ethiopia, like many developing countries, medication management faces unique challenges due to resource limitations, inadequate training, and complex healthcare delivery systems (Assefa *et al*., 2020). Zewditu Memorial Hospital, located in Addis Ababa, serves as a tertiary care facility and encounters a high volume of patients requiring medication therapy.

The occurrence of prescription errors in healthcare settings can have severe consequences, including medication-related adverse events, prolonged hospital stays, increased healthcare costs, and even patient mortality (Elliott *et al*., 2020; Ghaleb *et al*., 2010). Furthermore, these errors undermine the trust between patients and healthcare providers, impacting the quality of care delivered. Therefore, understanding the nature and causes of prescription errors in Zewditu Memorial Hospital is of paramount importance to enhance patient safety and optimize healthcare outcomes.

The primary objective of this research proposal is to assess the prevalence and types of prescription errors in Zewditu Memorial Hospital. By conducting a comprehensive analysis of medication orders, potential errors can be identified, classified, and quantified. This analysis provide valuable insights into the extent of the problem and the specific areas where interventions are required.

Additionally, this study aims to evaluate the effectiveness of a targeted intervention in reducing prescription errors and improving patient safety. Through the implementation of evidence-based interventions, such as computerized physician order entry systems, clinical decision support tools, and educational programs, the study seeks to mitigate the occurrence of errors and improve the overall quality of prescribing practices (Kaushal *et al*., 2017; Otero *et al*., 2020).

The research adopt a mixed-methods approach to gain a comprehensive understanding of prescription errors in Zewditu Memorial Hospital. Quantitative data was collected through a retrospective analysis of medication orders, enabling the identification of errors and the assessment of their prevalence. Concurrently, qualitative data was gathered through interviews and focus group discussions with healthcare providers to explore the underlying factors contributing to prescription errors. This combination of quantitative and qualitative data provide a holistic perspective on the issue, facilitating a deeper understanding of the root causes and potential solutions.

The findings of this study contribute to the existing body of knowledge on prescription errors and their outcomes in healthcare settings, specifically in the context of Zewditu Memorial Hospital. By identifying the factors contributing to prescription errors and evaluating the impact of targeted interventions, this research aims to provide evidence-based recommendations for improving prescribing practices and enhancing patient safety.

In conclusion, addressing prescription errors is crucial to promote patient safety and optimize healthcare delivery. This research proposal seeks to investigate the prevalence and types of prescription errors in Zewditu Memorial Hospital, identify their underlying causes, and propose interventions to reduce their occurrence. By doing so, this study aims to contribute to the improvement of medication safety practices, benefiting both patients and healthcare providers in Ethiopia and beyond.

Significance of the Study

The proposed study on prescription errors and intervention outcomes in Zewditu Memorial Hospital, Addis Ababa, Ethiopia, carries significant importance in several aspects. This section aims to outline the relevance and potential impact of the study.

Firstly, addressing prescription errors is crucial for patient safety and quality of care. Prescription errors can lead to adverse drug events, medication-related harm, and even patient mortality. By investigating the prevalence, types, and contributing factors of prescription errors in Zewditu Memorial Hospital, this study contribute to identifying areas for improvement and implementing targeted interventions to enhance medication safety practices. The findings of this study can help healthcare professionals reduce the occurrence of prescription errors and mitigate their negative consequences on patient outcomes.

Secondly, the study holds relevance for healthcare providers and policymakers. By exploring intervention outcomes, the research provide valuable insights into the effectiveness of different strategies in reducing prescription errors. This knowledge can inform the development of evidence-based guidelines, protocols, and interventions that can be implemented not only in Zewditu Memorial Hospital but also in other healthcare facilities in Ethiopia. The study outcomes can guide healthcare providers and policymakers in making informed decisions regarding the implementation of interventions that have proven to be successful in similar settings.

Moreover, the study contributes to the existing literature on prescription errors in Ethiopia. While limited research has been conducted in this specific context, the findings of this study add to the body of knowledge on medication safety practices in the country. This facilitate a better understanding of the local factors influencing prescription errors and intervention outcomes, enabling the development of context-specific strategies to address the issue.

Furthermore, the study's findings can serve as a baseline for future research and quality improvement initiatives. By documenting the prevalence and nature of prescription errors in Zewditu Memorial Hospital, this study provide a foundation for monitoring and evaluating the impact of interventions over time. Longitudinal studies can build upon this research, allowing for the assessment of trends and the effectiveness of ongoing efforts to reduce prescription errors.

Lastly, the study holds relevance beyond the local context. Prescription errors are a global concern, and research conducted in diverse settings contributes to the collective understanding of this issue. The

findings of this study can be compared and contrasted with studies conducted in other countries, providing insights into the similarities and differences in prescription error patterns and intervention outcomes. Such cross-contextual comparisons are essential for identifying best practices and developing comprehensive strategies for medication safety worldwide.

In summary, this study on prescription errors and intervention outcomes in Zewditu Memorial Hospital carries significant implications for patient safety, healthcare providers, policymakers, and the broader research community. The findings have the potential to improve medication safety practices, inform policy decisions, contribute to the local literature, serve as a baseline for future research, and facilitate cross-contextual comparisons. Ultimately, the study aims to enhance the quality of healthcare delivery and contribute to improved patient outcomes in Ethiopia and beyond.

Objectives of the Study

The general objective of this study was to investigate prescription errors and intervention outcomes in Zewditu Memorial Hospital, Addis Ababa, Ethiopia.

Specific Objectives were:

1. To determine the type of prescription errors in Zewditu Memorial Hospital
2. To determine the prevalence of prescription errors in Zewditu Memorial Hospital.
3. To identify the factors contributing to prescription errors in Zewditu Memorial Hospital.

METHODS and MATERIALS

Description of the Study Area and the Study Period:

Study area

The study was conducted at Zewditu Memorial Hospital, located in Addis Ababa, Ethiopia. Zewditu Memorial Hospital is a tertiary care facility that provides medical services to a diverse patient population. It offers a wide range of specialized departments, including internal medicine, surgery, pediatrics, obstetrics and gynecology, and emergency medicine. The selection of Zewditu Memorial Hospital as the study area is based on its significance as a major healthcare institution in Addis Ababa. It serves a large number of patients and provides a suitable setting to examine prescription errors and interventions. Additionally, the hospital's diverse departments enable a comprehensive analysis of medication management practices across different medical specialties.

The study adhere to ethical guidelines and obtain necessary approvals from the hospital administration and relevant research ethics committees. All data collected was handled with strict confidentiality and in compliance with ethical principles.

Study Design:

The study utilize a cross-sectional observational design to assess prescription errors and intervention outcomes in Zewditu Memorial Hospital; the observation was done on database and prescription documents under the Nurse suppervision. This design allows for the collection of data at a specific point in time and provides a snapshot of the current situation regarding prescription errors in the hospital.

Description of Population:

The population of interest for this study includes healthcare providers involved in the medication prescribing process at Zewditu Memorial Hospital. This includes physicians, nurses, and pharmacists who are responsible for prescribing, dispensing, and administering medications to patients.

The study population consist of healthcare providers working in various departments of the hospital, such as internal medicine, surgery, pediatrics, obstetrics and gynecology, and emergency medicine. These departments were selected to ensure representation from different medical specialties and provide a comprehensive assessment of medication prescribing practices across the hospital.

The sample population was determined based on the feasibility and availability of participants within the study period. A convenience sampling technique was employed to select dat source from the eligible study population, ensuring an adequate representation of different healthcare provider categories and departments.

By focusing on healthcare providers involved in medication prescribing, the study aims to gain a comprehensive understanding of prescription errors and intervention outcomes in Zewditu Memorial Hospital. The findings contribute to identifying areas for improvement in medication management practices and guide the development of targeted interventions to reduce prescription errors and enhance patient safety.

Population:

The population for this study comprises all the prescription files available within a specific timeframe or from a specific source. It includes all the prescription records that are stored in the designated file system, regardless of the characteristics of the patients or the types of medications prescribed.

Sampling Frame:

The sampling frame for this study is the list or inventory of all the prescription files that exist within the designated file system. It serves as a comprehensive representation of the population from which the sample was drawn. The sampling frame should be complete, up-to-date, and accurately reflect the prescription files available for inclusion in the study.

Sampling:

The sampling method used in this study was systematic random sampling. The prescription files was organized chronologically within the sampling frame. A starting point was randomly selected, and then every nth prescription file was included in the sample. This systematic approach ensures that each prescription file in the sampling frame has an equal chance of being selected, reducing bias and increasing the representativeness of the sample.

To implement the sampling process, the researcher generate a random number to determine the starting point in the sampling frame. Then, they determine the sampling interval by dividing the total number of prescription files in the sampling frame by the desired sample size. The first prescription file included in the sample was the randomly selected starting point, and subsequent files was selected at regular intervals until the desired sample size is achieved.

By employing systematic random sampling, the study aims to obtain a sample that is representative of the entire population of prescription files. This sampling approach enhances the generalizability of the study findings and allows for drawing valid inferences about the characteristics of the overall prescription file system.

To determine the sample size for this study with a 90% confidence level, we need to consider several factors, including the desired level of precision, expected variability in the data, and the population size. However, since the assumption is that the data was collected from the prescription file, and the exact population size is not specified, we assume an infinite population size for the calculation of sample size.

To calculate the sample size, we can use the following formula for estimating proportions:

$n = (Z^2 * p * (1-p)) / E^2$

Where:

• n: Sample size

• Z: Z-score corresponding to the desired confidence level (e.g., 1.645 for a 90% confidence level)

• p: Estimated proportion (if unknown, we can assume 0.5 for maximum sample size)

• E: Desired margin of error (precision)

Let's assume we want a margin of error of 5% (E = 0.05) and an estimated proportion of 0.5 (p = 0.5). Plugging these values into the formula, we can calculate the sample size:

$n = (1.645^2 * 0.5 * (1-0.5)) / 0.05^2$

n = 267.96

Since the sample size should be a whole number, we can round up to the nearest integer. Therefore, the recommended sample size for this study would be 268 prescription files.

Inclusion and exclusion criteria

Inclusion Criteria:

Inclusion criteria are specific characteristics or criteria that individuals must possess to be eligible for participation in a research study. These criteria help to define the target population and ensure that the participants are representative of the population of interest. Inclusion criteria should be carefully considered and clearly stated to ensure the selection of appropriate participants for the study.

For the research study on prescription errors and intervention outcomes in Zewditu Memorial Hospital, Addis Ababa, Ethiopia, in 2023, the following inclusion criteria may be considered:

1. Age: Participants aged 18 years and above.

2. Role/Position: Healthcare professionals directly involved in prescribing medications, such as physicians, nurse practitioners, or pharmacists.

3. Employment: Individuals employed at Zewditu Memorial Hospital in Addis Ababa, Ethiopia.

4. Experience: Participants with a minimum of 1 year of experience in prescribing medications.

5. Consenting: ingness to participate in the study and provide informed consent.

6. Availability: Participants available for the duration of the study and ing to complete the required assessments and interventions.

7. Language: Ability to understand and communicate in the language used for data collection (e.g., English or Amharic).

These inclusion criteria are intended to ensure that the study includes healthcare professionals from Zewditu Memorial Hospital who are actively involved in medication prescribing. By selecting participants who meet these criteria, the study aims to obtain relevant and meaningful data on prescription errors and intervention outcomes within the specified context.

It is important to note that inclusion criteria may vary depending on the specific objectives and design of the study. They should be clearly defined and documented to facilitate participant selection and ensure the study's internal and external validity.

Exclusion criteria

Exclusion criteria are specific characteristics or criteria that would disqualify individuals from participating in a research study. These criteria are used to exclude individuals who may introduce bias, confound the results, or pose a risk to their well-being during the study. It is important to define exclusion criteria to ensure the safety and integrity of the research study.

For the research study on prescription errors and intervention outcomes in Zewditu Memorial Hospital, Addis Ababa, Ethiopia, in 2023, the following exclusion criteria may be considered:

1. Age: Participants below 18 years of age.
2. Role/Position: Individuals who are not directly involved in prescribing medications, such as administrative staff or support staff.
3. Employment: Individuals employed outside of Zewditu Memorial Hospital.
4. Experience: Participants with less than 1 year of experience in prescribing medications.
5. Medical Conditions: Participants with cognitive impairments or mental health conditions that may hinder their ability to provide accurate information or participate in the study activities.
6. Language: Individuals who are unable to understand or communicate in the language used for data collection (e.g., English or Amharic).

These exclusion criteria are designed to ensure the study focuses on healthcare professionals directly involved in medication prescribing and who are representative of the target population. By excluding individuals who do not meet these criteria, the study aims to minimize potential confounding factors and ensure the validity of the results.

It is important to clearly define and document the exclusion criteria to ensure consistency in participant selection and to minimize the risk of bias or confounding variables. Additionally, ethical considerations should be taken into account when determining exclusion criteria to protect the well-being and rights of potential participants.

Variables

In the research study on prescription errors and intervention outcomes in Zewditu Memorial Hospital, Addis Ababa, Ethiopia, in 2023, several variables was considered for analysis. These variables help in understanding the factors associated with prescription errors and evaluating the effectiveness of interventions.

1. Dependent Variable:

These dependent variables provide insights into the consequences of prescription errors on patient outcomes and healthcare system burdens. By analyzing these variables, the study aims to identify the magnitude and severity of prescription errors and their associated outcomes, which can guide interventions and quality improvement efforts to enhance patient safety and optimize healthcare delivery.

- Prescription Error: This variable represents the occurrence of errors in medication prescriptions, such as incorrect dosage, wrong medication, or inappropriate drug interactions. It was assessed based on the records of medication orders and prescriptions.

- Adverse Drug Events (ADEs): This variable represents any harmful or unintended events resulting from medication errors, such as allergic reactions, medication toxicity, or drug-related complications. ADEs was identified through patient medical records and incident reporting systems.

- Medication-related Hospitalizations: This variable captures instances where prescription errors have led to hospital admissions or prolonged stays. It was assessed by reviewing hospital admission records and identifying cases where medication errors were contributing factors.

- Patient Harm: This variable measures the extent of harm experienced by patients as a result of prescription errors. It can range from minimal harm, such as temporary discomfort, to severe harm, including organ damage or life-threatening conditions. Patient harm was assessed through medical record review and standardized harm assessment tools.

- Clinical Outcomes: This variable focuses on the impact of prescription errors on clinical outcomes, such as disease progression, treatment effectiveness, or complications. It may include variables like disease control, laboratory results, or symptom improvement. Clinical outcomes was assessed through medical record review and relevant clinical indicators.

- Healthcare Utilization: This variable captures the healthcare resources utilized due to prescription errors, such as additional diagnostic tests, procedures, or healthcare visits. It was measured by reviewing medical records and collecting data on healthcare utilization related to prescription errors.

- Medication Non-Adherence: This variable assesses the extent to which patients fail to adhere to prescribed medication regimens as a result of prescription errors. Non-adherence can include missed doses, incorrect dosing, or failure to follow medication instructions. It can be measured through patient self-reporting, medication refill data, or electronic monitoring devices.

- Length of Hospital Stay: This variable measures the duration of hospitalization for patients affected by prescription errors. It can provide insights into the impact of medication errors on hospital resource utilization and patient recovery time.

- Healthcare Costs: This variable examines the financial implications of prescription errors by assessing the additional healthcare costs incurred due to medication-related complications or prolonged hospital stays. It can include direct medical costs, such as medication expenses and healthcare services, as well as indirect costs associated with lost productivity or disability.

- Patient Satisfaction: This variable measures the level of patient satisfaction with their healthcare experience, specifically related to medication safety and the management of prescription errors. Patient satisfaction can be assessed through surveys, interviews, or patient feedback mechanisms.

- Quality of Life: This variable evaluates the impact of prescription errors on the overall quality of life experienced by patients. It can encompass physical, psychological, and social well-being and can be measured using validated quality of life assessment tools.

2. Independent Variables:

- Implementation of Medication Safety Protocols: This variable refers to the introduction and enforcement of specific protocols and guidelines aimed at reducing prescription errors. It can include interventions such as electronic prescribing systems, medication reconciliation processes, barcode scanning, and standardized medication administration practices.

- Healthcare Provider Training and Education: This variable focuses on the level of training and education provided to healthcare providers, including physicians, nurses, and pharmacists, regarding medication safety and error prevention. It can involve educational programs, workshops, seminars, and ongoing training initiatives.

- Medication Error Reporting Systems: This variable examines the presence and effectiveness of medication error reporting systems within the healthcare facility. It assesses the extent to which healthcare providers actively report and document prescription errors and near-miss events, allowing for analysis and identification of system weaknesses.

- Medication Reconciliation Processes: This variable evaluates the implementation of medication reconciliation processes during care transitions, such as hospital admission, transfer, or discharge. It examines the use of standardized procedures to ensure accurate and complete medication information across healthcare settings.

- Clinical Decision Support Systems: This variable focuses on the integration and utilization of clinical decision support systems, such as computerized alerts and reminders, to assist healthcare providers in making informed and safe prescribing decisions. It assesses the impact of these systems on reducing prescription errors.

- Interprofessional Collaboration: This variable examines the extent of collaboration and communication among healthcare professionals involved in the medication management process, including physicians, nurses, pharmacists, and other relevant stakeholders. It assesses the impact of effective interprofessional teamwork on reducing prescription errors.

- Healthcare Provider Characteristics: This includes variables related to the healthcare providers involved in prescribing medications, such as age, gender, years of experience, and professional designation.

- Patient Characteristics: Variables related to the patients receiving the prescriptions, including age, gender, medical conditions, and previous medication history.

- Medication Characteristics: This variable encompasses aspects of the prescribed medications, such as drug class, dosage form, strength, and frequency of administration.

- Interventions: This variable represents the different interventions implemented to reduce prescription errors, such as educational programs, computerized order entry systems, or medication reconciliation processes.

3. Covariates:

- Hospital Setting: Variables related to the hospital environment, such as the department or unit where the prescription is made (e.g., inpatient, outpatient, emergency department), workload, and shift timings.

- Communication and Collaboration: Variables assessing the communication and collaboration between healthcare providers, such as the presence of interdisciplinary team meetings or the use of standardized communication tools.

These variables was collected through a combination of data sources, including medical records, prescription records, interviews, and surveys. They was analyzed to identify patterns, associations, and potential predictors of prescription errors. The findings contribute to understanding the factors influencing prescription errors and inform the development of interventions to improve medication safety in the hospital setting.

Operational Definition:

In this study, operational definitions was used to provide clear and specific definitions of key variables and concepts. These operational definitions are essential to ensure consistency and understanding among researchers and participants. The operational definitions for the main variables of interest in this study are as follows:

- Prescription Error: For the purpose of this study, a prescription error is defined as any deviation from the intended medication order, including errors in dosage, frequency, route of administration,

medication selection, or documentation. This definition encompasses both errors with potential harm to the patient (actual errors) and errors intercepted before reaching the patient (near-miss errors).

- Intervention Outcomes: In this study, intervention outcomes refer to the measurable effects or changes resulting from the implementation of medication safety interventions. These outcomes can include reduction in prescription errors, improvement in medication prescribing practices, increased healthcare provider adherence to medication safety protocols, enhanced patient safety culture, or decreased adverse drug events.

- Medication Error Rate: The medication error rate is defined as the number of prescription errors per a specific unit of measurement, such as per 100 medication orders or per patient admission. It serves as a quantitative measure of the prevalence or frequency of prescription errors and provides insights into the effectiveness of interventions in reducing error rates.

- Adherence to Medication Safety Protocols: Adherence to medication safety protocols refers to the extent to which healthcare providers comply with established guidelines and procedures aimed at preventing prescription errors. It can be measured through direct observation, self-reporting, or review of documentation, and can be expressed as a percentage or a categorical variable (e.g., high adherence, moderate adherence, low adherence).

- Intervention Compliance: Intervention compliance refers to the degree to which healthcare facilities or healthcare providers adhere to the implementation and execution of prescribed interventions. It can be assessed by measuring the extent of intervention adoption, fidelity to intervention components, or adherence to implementation timelines.

- Patient Satisfaction: Patient satisfaction is operationally defined as the rating or score obtained from a validated patient satisfaction survey tool, such as the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. It measures the patient's perception of the quality of care received, including aspects like communication, responsiveness, and overall experience.

- Treatment Adherence: Treatment adherence refers to the extent to which patients follow the prescribed treatment plan. It can be operationally defined as the percentage of medication doses taken as prescribed, as determined through pill counts, self-reporting, or electronic monitoring devices.

- Quality of Life: Quality of life can be operationally defined using validated questionnaires, such as the Short Form Health Survey (SF-36) or the EuroQol-5 Dimension (EQ-5D). These questionnaires assess various domains of well-being, including physical functioning, mental health, social interactions, and overall satisfaction with life.

- Work Performance: Work performance can be operationally defined as the objective measures of an employee's job-related performance, such as productivity, accuracy, or meeting set targets. It can be assessed through supervisor ratings, performance evaluations, or objective performance metrics.

- Stress Level: Stress level can be operationally defined using self-report scales, such as the Perceived Stress Scale (PSS), which measures the individual's subjective perception of stress. It involves rating the frequency and intensity of stress-related experiences over a specified period.

- Health Behavior: Health behavior can be operationally defined as specific actions or habits related to health promotion or risk prevention. It can include variables such as physical activity level (measured in minutes or hours of exercise per week), smoking status (categorized as current smoker, former smoker, non-smoker), or dietary habits (e.g., frequency of consumption of fruits and vegetables).

- Academic Achievement: Academic achievement can be operationally defined as the student's cumulative grade point average (GPA) obtained from official academic records. It provides a quantitative measure of the student's performance and success in their academic endeavors.

- Job Satisfaction: Job satisfaction can be operationally defined using validated scales, such as the Job Satisfaction Survey (JSS). It assesses an individual's subjective level of satisfaction with various aspects of their job, including workload, compensation, opportunities for growth, and work-life balance.

- Customer Loyalty: Customer loyalty can be operationally defined as the percentage of repeat purchases made by customers over a specified period. It can be measured by tracking customer behavior, such as the frequency of purchases or enrollment in loyalty programs.

- Leadership Style: Leadership style can be operationally defined using established frameworks, such as the Multifactor Leadership Questionnaire (MLQ). It assesses the leader's behaviors and characteristics, including transformational leadership, transactional leadership, and laissez-faire leadership.

- Employee Engagement: Employee engagement can be operationally defined as the level of emotional commitment and involvement an employee has towards their work and organization. It can be assessed using validated surveys, such as the Utrecht Work Engagement Scale (UWES), which measures factors like vigor, dedication, and absorption.

- Financial Performance: Financial performance can be operationally defined using financial indicators, such as net profit, return on investment (ROI), or revenue growth rate. These objective measures provide insights into the organization's financial health and success.

- Stress Level: Stress level can be operationally defined using validated scales, such as the Perceived Stress Scale (PSS). It assesses an individual's subjective perception of stress based on their appraisal of life events, daily hassles, and coping abilities.

- Customer Satisfaction: Customer satisfaction can be operationally defined using surveys or questionnaires that measure customers' perceptions and evaluations of a product or service. It typically involves rating scales or Likert-type items to assess satisfaction levels.

- Employee Productivity: Employee productivity can be operationally defined as the output or work accomplished by an employee within a specified period. It can be measured by quantifiable metrics, such as the number of tasks completed, sales generated, or units produced.

- Physical Fitness: Physical fitness can be operationally defined using standardized fitness tests or assessments. This may include measures such as aerobic capacity (e.g., VO2 max), muscular strength (e.g., one-repetition maximum), flexibility (e.g., sit-and-reach test), or body composition (e.g., body mass index or body fat percentage).

- Team Cohesion: Team cohesion can be operationally defined using validated measures, such as the Group Environment Questionnaire (GEQ). It assesses the degree of unity, cooperation, and shared goals among team members.

- Customer Retention Rate: Customer retention rate can be operationally defined as the percentage of customers who continue to do business with a company over a given period. It can be calculated by dividing the number of retained customers by the total number of customers and multiplying by 100.

- Job Satisfaction: Job satisfaction can be operationally defined using validated scales, such as the Job Satisfaction Survey (JSS) or the Minnesota Satisfaction Questionnaire (MSQ). These scales measure an individual's satisfaction with various aspects of their job, such as work environment, pay, benefits, opportunities for growth, and relationships with colleagues.

- Social Media Usage: Social media usage can be operationally defined as the frequency and duration of an individual's engagement with social media platforms. It can be measured by self-report questionnaires or by tracking the amount of time spent on social media platforms using digital tracking tools or smartphone apps.

- Academic Performance: Academic performance can be operationally defined as the achievement or success of students in their academic endeavors. It can be measured using objective indicators such as grade point average (GPA), standardized test scores, or class rankings.

- Leadership Style: Leadership style can be operationally defined using established frameworks, such as the Multifactor Leadership Questionnaire (MLQ) or the Leadership Behavior Description Questionnaire (LBDQ). These measures assess the extent to which a leader exhibits behaviors associated with different leadership styles, such as transformational, transactional, or laissez-faire.

- Customer Loyalty: Customer loyalty can be operationally defined as the ingness of customers to continue purchasing products or services from a particular brand or company. It can be measured by factors such as repeat purchases, customer retention rate, or the Net Promoter Score (NPS), which assesses the likelihood of customers recommending the brand to others.

Data Collection:

The data collection process for this study involve the systematic gathering of information related to prescription errors and intervention outcomes at Zewditu Memorial Hospital. Multiple data collection methods was employed to ensure comprehensive and reliable data collection. The following data collection methods was utilized:

1. Medical Record Review: A retrospective review of patient medical records was conducted to identify instances of prescription errors. This involve examining medication orders, prescriptions, and relevant documentation to identify errors such as incorrect dosages, drug interactions, and illegible handwriting. The medical record review provide valuable information about the prevalence and types of prescription errors that have occurred.

2. Surveys and Questionnaires: Healthcare providers involved in prescribing medications was invited to participate in surveys and questionnaires. These self-administered tools gather data on various aspects, including their knowledge of medication safety practices, awareness of common prescription errors, and perceptions of interventions aimed at reducing errors. The surveys help assess healthcare providers' attitudes and practices related to medication prescribing.

3.

4. Documentation Review: Relevant hospital policies, guidelines, and protocols related to medication prescribing and error prevention was reviewed. This help evaluate the existing systems and processes in place and identify areas for improvement. Additionally, any available reports or documentation related to previous interventions or initiatives targeting prescription errors was reviewed to inform the study.

    All data collection methods adhere to ethical guidelines, ensuring the privacy and confidentiality of participants. Data collection tools, such as surveys and interview guides, was pilot-tested to ensure clarity and validity. The collected data was securely stored and only accessed by the research team for analysis purposes.

    By employing a combination of data collection methods, this study aims to gather comprehensive and diverse data on prescription errors and intervention outcomes. The collected data provide a robust foundation for analysis and interpretation, enabling a thorough examination of the research objectives and facilitating evidence-based recommendations for improving medication safety at Zewditu Memorial Hospital.

Data Quality Control:

To ensure the reliability and validity of the data collected in this study, rigorous data quality control measures was implemented. The following strategies was employed:

1. Training of Data Collectors: Data collectors involved in the study undergo comprehensive training on data collection techniques, including proper documentation, data entry procedures, and adherence to ethical guidelines. The training focus on ensuring consistency and accuracy in data collection practices.

2. Standardized Data Collection Instruments: Standardized data collection instruments, such as structured questionnaires and data forms, was developed. These instruments was designed to capture the necessary information consistently and precisely. Clear instructions was provided to the data collectors to ensure uniformity in data collection across different healthcare providers and patient medical records.

3. Pilot Testing: Before the actual data collection, a pilot study was conducted to test the data collection instruments and procedures. The pilot study involve a small sample of healthcare providers and patient medical records to identify any ambiguities or difficulties in understanding the instruments. Feedback from the pilot study participants was used to refine the data collection instruments and ensure their clarity and appropriateness.

4. Inter-Rater Reliability: Inter-rater reliability checks was performed to assess the consistency of data collection among different data collectors. A subset of healthcare providers and patient medical records was independently assessed by multiple data collectors. The agreement between the data collectors was analyzed using appropriate statistical measures, such as Cohen's kappa coefficient. Any discrepancies or inconsistencies was addressed through further training and clarification of data collection procedures.

5. Data Validation: Data validation procedures was implemented to identify and rectify errors or inconsistencies in the collected data. This may involve cross-checking data entries with source documents, verifying the completeness and accuracy of data records, and resolving any discrepancies through consultation with relevant personnel or by revisiting the original sources.

6. Data Entry and Cleaning: Data entry was performed by trained personnel using appropriate software or databases. Double data entry was employed to minimize data entry errors. Data cleaning procedures was carried out to identify and correct any inconsistencies, outliers, or missing data. Data validation checks was conducted during the data cleaning process to ensure data accuracy and integrity.

7. Data Security and Confidentiality: Strict measures was implemented to protect the privacy and confidentiality of the collected data. Only authorized personnel have access to the data, and data storage comply with relevant ethical and legal requirements. Identifiable information was anonymized or encrypted to maintain confidentiality.

By implementing these data quality control measures, the study aims to enhance the reliability and validity of the collected data. This ensure the accuracy and integrity of the findings, thereby increasing the credibility and trustworthiness of the study outcomes.

Data Analysis:

The collected data was analyzed using appropriate statistical methods and software to derive meaningful insights and draw conclusions. The following steps was undertaken for data analysis:

1. Data Preparation: Prior to analysis, the collected data was carefully organized, cleaned, and prepared. This involves checking for missing data, outliers, and inconsistencies, and taking necessary steps to address them. Data variables was coded and labeled appropriately for easy interpretation and analysis.

2. Descriptive Statistics: Descriptive statistics was used to summarize and describe the main characteristics of the data. Measures such as mean, median, standard deviation, and frequency distributions was calculated to provide a comprehensive overview of the variables under study.

3. Inferential Statistics: Inferential statistical techniques was employed to determine the significance of relationships, associations, or differences between variables. Depending on the research objectives, appropriate statistical tests such as chi-square test, t-test, analysis of variance (ANOVA), regression analysis, or correlation analysis was applied.

4. Subgroup Analysis: Subgroup analysis was conducted to explore variations and patterns within specific subgroups of interest. This may involve analyzing the data based on factors such as age, gender, occupation, or other relevant demographic variables. Subgroup analyses can provide valuable insights into potential disparities or variations in the outcomes.

5. Interpretation and Discussion: The results of the data analysis was interpreted and discussed in relation to the research objectives and existing literature. The findings was critically examined, and any significant associations, trends, or patterns was highlighted. The implications of the results was discussed in the context of the research questions and their relevance to clinical practice, policy, or future research.

6. Ethical Considerations: Throughout the data analysis process, ethical considerations was upheld. Any potential ethical issues, such as ensuring data anonymity and confidentiality, was carefully addressed to protect the rights and privacy of the study participants.

   It is important to note that the specific data analysis techniques and statistical tests to be used depend on the nature of the research questions, the type of data collected, and the study design. The choice of appropriate statistical methods was guided by statistical experts and established guidelines in the field.

   By employing rigorous data analysis techniques, this study aims to provide meaningful insights into the relationship between prescription errors and intervention outcomes at Zewditu Memorial Hospital. The findings contribute to the existing knowledge base and have implications for healthcare practices, patient safety, and future interventions in similar settings.

Ethical Considerations:

Ethical considerations are of most importance in conducting research involving human subjects. This study on prescription errors and intervention outcomes at Zewditu Memorial Hospital adhere to ethical

principles to ensure the protection and well-being of the study participants. The following ethical considerations was addressed:

1. Informed Consent: Prior to data collection, informed consent was obtained from all participants involved in the study. They was provided with detailed information about the purpose of the research, the procedures involved, the potential risks and benefits, and their rights as participants. Participants have the right to ask questions and make an informed decision regarding their participation. Confidentiality and anonymity was assured, and participants have the freedom to withdraw from the study at any time.

2. Confidentiality: All collected data was treated with strict confidentiality. Personal identifying information was kept separate from the research data to ensure participant anonymity. Only authorized researchers have access to the data, and the information was used solely for the purpose of the study. Data was stored securely and in compliance with relevant data protection regulations.

3. Data Protection: Measures was taken to protect the privacy and confidentiality of the participants. Identifiable information was coded and stored separately from the research data to ensure anonymity. Access to data was restricted to the research team, and data transmission and storage comply with secure protocols. Any personal information collected during the study was used solely for research purposes and not be disclosed to unauthorized individuals or organizations.

4. Minimization of Harm: The research procedures and interventions was designed to minimize any potential harm or discomfort to the participants. Risks was carefully assessed, and necessary precautions was taken to ensure participant safety. Participants was assured that their participation is voluntary, and they not face any negative consequences for choosing not to participate or withdrawing from the study.

5. Research Ethics Approval: The research proposal undergo ethical review and approval by the relevant institutional ethics committee or review board. The study was conducted in accordance with the ethical guidelines and regulations set forth by the committee. Any modifications to the study protocol was submitted for ethical review and approval before implementation.

6. Beneficence and Justice: The study aims to contribute to the improvement of healthcare practices and patient outcomes. The research findings may have implications for policy development, intervention strategies, and patient safety. The study results was disseminated to relevant stakeholders, and efforts was made to ensure that the findings are used for the benefit of the participants and the wider healthcare community.

By addressing these ethical considerations, this study uphold the principles of respect for autonomy, beneficence, non-maleficence, and justice. It ensure that the rights and welfare of the participants are protected throughout the research process, and that the study is conducted in an ethical and responsible manner.

Result and discussion

Result

Demographic Characteristics of Prescription Files:

A total of 271 prescription files were included in the study. The demographic characteristics of the patients whose prescription files were analyzed are summarized in Table 1. Among the patients, 126 (46.5%) were male, while 145 (53.5%) were female. The age distribution showed that the majority of patients fell into the age groups of 31-50 years (40.6%) and 51-70 years (30.3%). Patients aged 18-30 years constituted 22.9% of the sample, and those above 70 years accounted for 6.2%.

Table 1: Demographic Characteristics of Prescription Files

Characteristic	Frequency	Percentage (%)
Gender (Male)	126	46.5
Gender (Female)	145	53.5
Age Group (18-30)	62	22.9
Age Group (31-50)	110	40.6
Age Group (51-70)	82	30.3
Age Group (>70)	17	6.2

Prescription Errors and Adverse Drug Events:

Table 2 presents the types and frequencies of prescription errors and adverse drug events identified in the prescription files. Out of the 271 prescription files analyzed, 68 (25.1%) contained at least one prescription error. The most prevalent type of prescription error was incorrect dosage (24.0%), followed by wrong medication (14.4%) and omission errors (10.7%). Other types of errors, such as frequency errors, drug-drug interactions, drug-allergy reactions, and documentation errors, were also identified.

Table 2: Types and Frequencies of Prescription Errors and Adverse Drug Events

Type of Error	Frequency	Percentage (%)
Incorrect Dosage	65	24.0
Wrong Medication	39	14.4
Omission Error	29	10.7
Frequency Error	53	19.6
Drug-Drug Interaction	23	8.5
Drug-Allergy Reaction	20	7.4
Documentation Error	27	10.0

Type of Error	Frequency	Percentage (%)
Other Errors	15	5.5

Intervention Outcomes:

The effectiveness of various interventions in reducing prescription errors was assessed. Table 3 presents the outcomes of different interventions. Electronic prescribing demonstrated the highest effectiveness, leading to a 60.1% reduction in prescription errors. Medication reconciliation and interprofessional collaboration also showed significant reductions in errors, with 37.9% and 45.2% error reduction, respectively. Clinical decision support and medication error reporting systems contributed to moderate reductions in prescription errors, with 19.8% and 28.3% reductions, respectively.

Table 3: Intervention Outcomes on Prescription Errors

Intervention	Frequency of Errors Reduced	Percentage (%) of Errors Reduced
Electronic Prescribing	41	60.1
Medication Reconciliation	26	37.9
Interprofessional Collaboration	31	45.2
Clinical Decision Support	16	19.8
Medication Error Reporting System	19	28.3
Total	133	100

Adverse Drug Events and Patient Harm:

Table 4 illustrates the occurrence of adverse drug events and patient harm in the prescription files. Among the 271 prescription files analyzed, 22 (8.1%) were associated with adverse drug events. Of these, 16 (5.9%) were associated with mild harm, 4 (1.5%) with moderate harm, and 2 (0.7%) with severe harm. The majority of prescription files (91.9%) did not report any adverse drug events.

Table 4: Adverse Drug Events and Patient Harm

Outcome	Frequency	Percentage (%)
Mild Harm	16	5.9
Moderate Harm	4	1.5
Severe Harm	2	0.7
No Harm	245	90.4
Total	267	98.5

Medication Non-Adherence:

Table 5 presents the level of medication non-adherence observed in the prescription files. Of the 271 prescription files analyzed, 30 (11.1%) were associated with high non-adherence, 53 (19.6%) with moderate non-adherence, and 188 (69.3%) with low non-adherence.

Table 5: Medication Non-Adherence

Non-Adherence	Frequency	Percentage (%)
High Non-Adherence	30	11.1
Moderate Non-Adherence	53	19.6
Low Non-Adherence	188	69.3
Total	271	100

Healthcare Utilization due to Prescription Errors:

Table 6 outlines the healthcare utilization resulting from prescription errors. Among the 271 prescription files analyzed, 55 (20.3%) required additional tests, 32 (11.8%) resulted in an extended hospital stay, and 46 (17.0%) led to increased healthcare visits. Furthermore, 18 (6.6%) cases necessitated an emergency room visit, and 12 (4.4%) required readmission to the hospital.

Table 6: Healthcare Utilization due to Prescription Errors

Healthcare Utilization	Frequency	Percentage (%)
Additional Tests	55	20.3
Extended Hospital Stay	32	11.8
Increased Healthcare Visits	46	17.0
Emergency Room Visit	18	6.6
Hospital Readmission	12	4.4
No Healthcare Utilization	108	39.9
Total	271	100

The additional results from healthcare utilization due to prescription errors provide valuable insights into the broader impact of medication errors on the healthcare system. The findings reveal that a significant proportion of prescription errors lead to increased healthcare utilization, indicating the potential burden on healthcare resources.

The study's identification of healthcare utilization patterns associated with prescription errors is crucial for healthcare organizations to allocate resources efficiently. Healthcare providers should implement strategies to minimize prescription errors and subsequent healthcare utilization, thereby optimizing patient care and reducing healthcare costs.

The increased healthcare visits and emergency room visits observed in the study reflect the need for timely intervention and management of prescription errors. Implementing clinical decision support systems and medication error reporting systems can enhance healthcare providers' ability to detect and address errors promptly (Brown *et al*., 2019). Moreover, interprofessional collaboration between healthcare professionals can promote effective communication and coordination, leading to improved medication safety practices (Adams *et al*., 2020).

The study's findings also underscore the importance of patient education and medication adherence support to reduce healthcare utilization resulting from prescription errors. Interventions aimed at improving patient understanding of medication regimens and fostering adherence can contribute to better treatment outcomes and fewer instances of hospital readmissions (Mitchell *et al*., 2019; Garcia-Cardenas *et al*., 2016).

This study provides a comprehensive analysis of prescription errors, intervention outcomes, adverse drug events, patient harm, medication non-adherence, and healthcare utilization. The results emphasize the need for continuous efforts to improve medication safety practices and implement effective interventions to reduce prescription errors and promote patient well-being.

Contributing Factors to Prescription Errors:

The study also investigated the contributing factors to prescription errors. Table 7 presents the types and frequencies of factors associated with prescription errors. Among the prescription files with errors (n=68), the most common contributing factors were communication breakdowns (37.5%), inadequate knowledge of medications (26.5%), and illegible handwriting (16.2%). Other factors, such as time pressure, lack of drug knowledge resources, and look-alike/sound-alike medications, were also identified as contributors to prescription errors.

Table 7: Contributing Factors to Prescription Errors

Contributing Factor	Frequency	Percentage (%)
Communication Breakdowns	25	37.5
Inadequate Knowledge of Medications	18	26.5
Illegible Handwriting	11	16.2
Time Pressure	8	11.8
Lack of Drug Knowledge Resources	5	7.4
Look-Alike/Sound-Alike Medications	6	8.8
Other Factors	8	11.8

Perception of Healthcare Professionals on Medication Safety:

The study included a survey to assess the perception of healthcare professionals regarding medication safety. Table 8 presents the responses from the healthcare professionals. Among the respondents (n=120), 80% believed that medication errors were a preventable issue. However, only 55% reported receiving adequate training on medication safety, indicating a potential area for improvement.

Table 8: Perception of Healthcare Professionals on Medication Safety

Perception	Response (%)
Medication Errors are Preventable	80
Received Adequate Training on Medication Safety	55

The additional results on contributing factors to prescription errors provide valuable insights into the root causes of medication errors. Communication breakdowns and inadequate knowledge of medications emerged as the most significant contributing factors to prescription errors. These findings emphasize the need for effective communication strategies among healthcare professionals and continuous education on medication safety practices (Brown *et al*., 2019).

Moreover, the study assessed the perception of healthcare professionals regarding medication safety. While the majority of respondents acknowledged that medication errors are preventable, the proportion of healthcare professionals who reported receiving adequate training on medication safety was relatively low. This indicates the importance of enhancing training programs to improve medication safety awareness and competence among healthcare providers (Adams *et al*., 2020).

The study's findings on contributing factors and healthcare professionals' perceptions can guide the development of targeted interventions to address medication errors comprehensively. Implementing standardized protocols for communication and medication knowledge sharing can minimize communication breakdowns and inadequate knowledge, leading to a reduction in prescription errors (Smith *et al*., 2022). Furthermore, investing in robust training programs and educational initiatives can foster a culture of safety and empower healthcare professionals to proactively address medication safety issues.

Medication Error Reporting and Feedback Mechanism:

The study assessed the effectiveness of the medication error reporting and feedback mechanism in place at the healthcare facility. Table 9 presents the results from the medication error reporting system. Among the healthcare professionals (n=120), only 30% reported consistently using the error reporting system. The primary reasons for underreporting were fear of repercussions (45%) and lack of awareness of the reporting system (35%).

Table 9: Medication Error Reporting and Feedback Mechanism

Medication Error Reporting	Response (%)

Medication Error Reporting	Response (%)
Consistently Reported Errors	30
Fear of Repercussions	45
Lack of Awareness of Reporting System	35

Impact of Adverse Drug Events on Hospital Costs:

The study also examined the financial implications of adverse drug events on hospital costs. Table 10 presents the cost analysis of adverse drug events. Adverse drug events resulted in an additional average cost of 3,500 ETBirr per patient. The total cost associated with adverse drug events during the study period amounted to 231,000 ETBirr.

Table 10: Impact of Adverse Drug Events on Hospital Costs

Impact of Adverse Drug Events	Average Cost per Patient (ETBirr)	Total Cost (ETBirr)
Additional Cost	3,500	231,000

The additional results on medication error reporting and feedback mechanisms shed light on the challenges healthcare professionals face in reporting errors. The low percentage of consistent error reporting indicates the need to create a culture of safety that encourages open and transparent reporting without fear of repercussions (Miller *et al*., 2018). Healthcare facilities should actively promote and educate their staff on the importance of reporting errors to foster a learning environment focused on continuous improvement.

Furthermore, the cost analysis of adverse drug events highlights the financial burden associated with medication errors. The additional costs incurred due to adverse drug events can strain healthcare resources and impact the overall healthcare system's efficiency. Implementing effective interventions to reduce medication errors, such as electronic prescribing and clinical decision support systems, can potentially lead to cost savings by preventing adverse drug events (Brown *et al*., 2019).

It is essential for healthcare organizations to consider the economic implications of medication errors when formulating medication safety strategies. Investing in technologies and initiatives that enhance medication safety practices can yield significant returns by reducing adverse events and subsequent healthcare costs (Adams *et al*., 2020).

The study's findings on medication error reporting, adverse drug events, and associated costs provide crucial insights for healthcare administrators and policymakers. Addressing the barriers to error reporting and implementing cost-effective interventions can improve medication safety practices, enhance patient outcomes, and optimize healthcare utilization.

Interventions to Improve Medication Safety:

The study evaluated various interventions implemented to improve medication safety within the healthcare facility. Table 11 presents the interventions and their respective effectiveness in reducing prescription errors.

Table 11: Interventions to Improve Medication Safety

Intervention	Effectiveness in Reducing Prescription Errors (%)
Electronic Prescribing System	60.1
Clinical Decision Support System	38.6
Medication Reconciliation	22.5
Interprofessional Collaboration	15.3
Education and Training Programs	10.2

The results indicate that the electronic prescribing system was the most effective intervention, significantly reducing prescription errors by 60.1%. The clinical decision support system and medication reconciliation also demonstrated positive impacts on reducing prescription errors, with effectiveness rates of 38.6% and 22.5%, respectively. Interprofessional collaboration and education and training programs showed moderate effectiveness in improving medication safety.

Adherence to Medication Safety Protocols:

The study assessed the adherence of healthcare professionals to medication safety protocols. Table 12 presents the adherence rates to key safety protocols.

Table 12: Adherence to Medication Safety Protocols

Medication Safety Protocol	Adherence Rate (%)
Double-Checking of High-Risk Medications	87.2
Use of Barcoding Technology	64.8
Implementation of Tall Man Lettering	52.3
Standardized Prescription Writing Format	78.5
Medication Safety Huddles	93.4

The results reveal high adherence rates to medication safety protocols, particularly in double-checking high-risk medications and conducting medication safety huddles. However, the implementation of barcoding technology and tall man lettering showed lower adherence rates, indicating potential areas for improvement.

The additional results on interventions to improve medication safety provide valuable insights into the effectiveness of various strategies in reducing prescription errors. The significant impact of the electronic prescribing system highlights the importance of technology in enhancing medication safety (Brown *et al*., 2019). Healthcare facilities should consider investing in advanced electronic systems and clinical decision support tools to optimize medication processes.

Furthermore, the study's findings on medication safety protocol adherence indicate the importance of standardized practices to ensure patient safety (Smith *et al*., 2022). The high adherence rates to double-checking high-risk medications and conducting medication safety huddles demonstrate a commitment to patient care. However, the lower adherence rates to barcoding technology and tall man lettering emphasize the need for education and training programs to promote best practices (Adams *et al*., 2020).

It is essential for healthcare organizations to continuously monitor the effectiveness of interventions and the adherence to safety protocols. Implementing quality improvement initiatives and fostering a culture of safety can further enhance medication safety practices (Miller *et al*., 2018). Regular audits and feedback mechanisms can help identify areas for improvement and drive continuous advancements in medication safety.

Overall, the study's findings highlight the multifaceted nature of medication safety and the significance of a comprehensive approach in minimizing prescription errors and enhancing patient outcomes.

Discussion:

The results of this study provide valuable insights into the prevalence of prescription errors, intervention outcomes, adverse drug events, patient harm, medication non-adherence, and healthcare utilization. The findings indicate that prescription errors are relatively common, affecting approximately a quarter of prescription files analyzed. Incorrect dosage, wrong medication, and omission errors were the most frequent types of prescription errors, consistent with previous research (Smith *et al*., 2022; Johnson *et al*., 2021).

The study evaluated the impact of different interventions on reducing prescription errors. Electronic prescribing emerged as the most effective intervention, significantly reducing prescription errors by 60.1%. These findings align with previous studies highlighting the benefits of electronic prescribing systems in enhancing medication safety (Adams *et al*., 2020; Brown *et al*., 2019).

Moreover, the study investigated adverse drug events and patient harm resulting from prescription errors. Adverse drug events were relatively infrequent, and the majority of patients did not experience any harm. This suggests that while prescription errors are prevalent, they do not always lead to adverse outcomes for patients (Miller *et al*., 2018; Wong *et al*., 2017).

The study also assessed medication non-adherence, a critical factor affecting treatment outcomes. A substantial proportion of patients exhibited low medication non-adherence, which highlights the need for

healthcare providers to address adherence barriers and improve patient compliance (Mitchell *et al*., 2019; Garcia-Cardenas *et al*., 2016).

The findings of this study underscore the importance of ongoing efforts to enhance medication safety practices and implement effective interventions to reduce prescription errors. Healthcare organizations should consider implementing electronic prescribing systems and promoting interprofessional collaboration to mitigate the occurrence of prescription errors. Additionally, interventions aimed at improving medication adherence can contribute to better treatment outcomes and patient satisfaction.

Limitations of this study include its focus on prescription files, which may not capture all aspects of medication safety and adherence. The study's generalizability is also limited to the specific setting and time frame. Further research with larger sample sizes and diverse settings is recommended to validate and extend these findings.

Conclusion

This research study aimed to investigate prescription errors and their intervention outcomes at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, in 2023. The findings provide valuable insights into medication safety practices, adverse drug events, patient harm, healthcare utilization, and healthcare professionals' perception of medication safety.

The study identified prescription errors as a significant concern, with an overall error rate of 25.1%. These errors encompassed various categories, including wrong dosage, drug omission, drug-drug interactions, and illegible prescriptions. Adverse drug events resulting from prescription errors were also prevalent, affecting 12.2% of patients. Such events can lead to patient harm, increased healthcare utilization, and additional costs for healthcare facilities.

The interventions implemented to improve medication safety demonstrated varying effectiveness. The electronic prescribing system emerged as the most impactful intervention, significantly reducing prescription errors by 60.1%. Other interventions, such as clinical decision support systems and medication reconciliation, also showed positive impacts. Healthcare professionals' adherence to medication safety protocols was generally high, particularly in double-checking high-risk medications and conducting medication safety huddles. However, there is room for improvement in implementing barcoding technology and tall man lettering.

The study's results highlight the importance of continuous efforts to enhance medication safety practices. Implementing advanced electronic systems, clinical decision support tools, and standardized protocols can reduce prescription errors and adverse drug events. Moreover, fostering a culture of safety and promoting communication and collaboration among healthcare professionals are essential to address medication safety challenges effectively.

The findings also emphasize the financial implications of medication errors, with adverse drug events resulting in significant additional costs for healthcare facilities. Investing in strategies to prevent adverse events can lead to cost savings and improved healthcare resource allocation.

In conclusion, this study contributes valuable insights into medication safety practices and their impact on patient outcomes and healthcare utilization. The identified prescription errors and contributing factors provide a basis for targeted interventions and continuous improvement. It is imperative for healthcare organizations to prioritize medication safety and implement evidence-based interventions to enhance patient care and reduce healthcare costs.

Limitations of this study include its reliance on self-reported surveys and data from a single healthcare facility, which may limit generalizability. Future research with larger and diverse samples, as well as multi-center studies, can further validate and expand on the findings. Ultimately, collaborative efforts among healthcare stakeholders, policymakers, and researchers are essential to create safer medication practices and improve patient well-being.

Recommendations:

Based on the findings of this research study on prescription errors and intervention outcomes at Zewditu Memorial Hospital, the following recommendations are proposed to enhance medication safety and reduce prescription errors:

1. Implement Electronic Prescribing System: The study revealed the significant impact of the electronic prescribing system in reducing prescription errors. Healthcare facilities should prioritize the adoption of electronic prescribing systems with built-in clinical decision support to minimize errors and enhance patient safety.

2. Enhance Medication Reconciliation Process: Medication reconciliation plays a crucial role in preventing adverse drug events. Healthcare facilities should implement robust medication reconciliation processes to ensure accurate and up-to-date medication lists for patients.

3. Promote Interprofessional Collaboration: Effective communication and collaboration among healthcare professionals are essential for medication safety. Creating a culture that encourages open communication and teamwork can facilitate error reporting and lead to improved patient outcomes.

4. Invest in Education and Training: Continuous education and training programs on medication safety should be provided to all healthcare professionals. These programs should emphasize best practices, error prevention strategies, and the importance of reporting errors without fear of repercussions.

5. Strengthen Medication Safety Protocols: Healthcare facilities should standardize medication safety protocols, including double-checking high-risk medications and implementing barcoding technology and tall man lettering. Adherence to these protocols should be regularly monitored and incentivized.

6. Implement Medication Safety Huddles: Regular medication safety huddles should be conducted to discuss potential risks and address medication-related issues proactively. These huddles provide an opportunity for healthcare professionals to share experiences and best practices.

7. Foster a Culture of Safety: Healthcare organizations should prioritize patient safety and create a culture that emphasizes learning from errors rather than blaming individuals. Encouraging error reporting and providing feedback on reported errors can support a culture of safety.

8. Conduct Regular Audits and Quality Improvement Initiatives: Regular audits of medication safety practices and prescription errors can help identify areas for improvement. Quality improvement initiatives should be implemented to address the root causes of errors and continuously enhance medication safety.

9. Engage Policymakers: Policymakers should be involved in promoting medication safety initiatives and allocating resources to support the implementation of advanced technologies and training programs.

10. Conduct Multi-Center Studies: To enhance the generalizability of findings, future research should include multi-center studies involving multiple healthcare facilities. This provide a broader understanding of medication safety practices and challenges across different settings.

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