

Magnitude of medication administration error and associated factors in adult intensive care units of federally administered public hospitals in addis ababa, Ethiopia, 2019.

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Abstract

Introduction: Medications are the basis of care provision. Despite the best effort, increased use of technology and high standards of invasive and non-invasive monitoring in critical care, medication errors continue to occur even at the best centres worldwide.

Objective: To assess magnitude of medication administration error and associated factors in adult intensive care units of federally administered public Hospitals in Addis Ababa, April 4- April 27, 2019 GC.

Methods: Institutional based cross sectional study was used. A probability sampling method specifically simple random sampling was employed to collect data.

Result: Based on this study medication administration error in federally administered public hospitals adult intensive care unit of Addis Ababa city was 61.1% with the most frequent error of technical error (59.7%), followed by wrong time (52.3%) and documentation error (24.8%).

Nurse to patient ratio, shift of medication administration, polypharmacy and nurse experience were associated factors with medication administration error.

Conclusion and recommendation: In conclusion medication administration errors in adult intensive care unit of federally administered public hospital of Addis Ababa were highly prevalent. Medication administration protocol and procedure, training for new staff and making nurse to patient ratio one to one were recommended.

Keywords: Medication error, ICU.

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Introduction

Medicines are chemical compounds administered for the purpose of diagnosis, treatment, and prevention. Hence all medication has toxic effects, all medications are expected to be administered carefully to attain desired outcome, and to avoid adverse drug reactions. Nurses administer almost all medication in hospitals especially those in Critical care unit. Medications are the basis of care provision. Even though safe use of medications can improve and save the lives of millions errors in the use of these substances can lead to equally significant consequences. Although the process of delivering medications to patients encompasses a number of steps requiring collaboration between medical practitioners, registered nurses and pharmacists, it is the main responsibility of nurses to ensure the safe administration of medication. Medication administration is one of basic nursing responsibility, which needs specialized knowledge, decision making, and skill based on the principles of pharmacology but unfortunately, errors can lead in serious consequences for patients and legal impacts for nurses.

According to USA National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) medication error can be defined as “any preventable event that may cause or lead to inappropriate medication use or patient hurt while the medication is in the control of the health care professional, patient, or consumer. Such events can be related

to professional practice, health care products, procedures, and systems, comprising prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use”. it can occur at any stage of the medication use process, including prescription, dispensing, preparation and administration. Administration error occur when a discrepancy occurs between the drug received by the patient and the drug therapy intended by the prescriber or manufacturers' preparation and administration instructions.

Statement of the problem

Medication error can cause at least one death every day and injuries approximately 1.3 million people annually in United States of America alone. While low and middle income countries are expected to have comparable rates of medication related adverse events to high income countries. However many countries lack good data, which will be gathered as part of quality health care initiative. Away from damaging people physically, psychologically, and in some cases taking their lives, medication errors result in a massive cost burden, globally the cost associated with medication errors has been estimated \$42 billion annually almost 1 % of total global health expenditure, and approximate cost of \$17-\$29 billion per annum in USA. Patients in ICU are at a high-risk for medication errors because of the following reason. Critically ill

patients receive almost twice as many medicines as hospital patients outside the intensive care unit (ICU) most of ICU medications are given parenteral and involve calculations for bolus and continuous infusion and ICU patients are often sedated, and cannot detect possible errors by themselves. Despite the best effort, increased use of technology and high standards of invasive and non-invasive monitoring in anesthesia and critical care, medication errors continue to occur even at the best centers worldwide. As far as my search in our country Ethiopia only one descriptive study was done about intensive care unit medication administration error, at Jimma University Specialized Hospital Intensive care unit and it concluded 51.8% of medication administrations were leveled as an error [1]. Even though most of specialized hospitals with ICU in Ethiopia, located at Addis Ababa there is no study done in Addis Ababa about medication administration error therefore this study was intended to assess medication administration error and associated factors in federally administered hospitals ICU of AA city.

Significance of the study

Patient safety is an important health care issue because of the impacts of iatrogenic injuries. Critical care Unit has one of the highest incidences of medication administration error than any other specialized units. This is believed to be related to the rapidly changing patient status, complex diagnoses and treatment. Identifications of the most common error types, drugs associated with errors, factors contributing to errors, and serious consequences of errors, is necessary to guide focused efforts to prevent medication errors. In fact, there are few studies about medication error but researchers have not yet paid enough attention to critical care unit. This study was intended to identify magnitude of medication administration error and associated factors in adult intensive care units of federally administered public hospitals in AA. The result would be important for national policy maker, local managers and for health professional to promote safe medication administration practice. In addition to this the finding would have significant effect to prevent mortality, morbidity and adverse drug effect related to medication administration error. Furthermore, the finding would be used as a reference for other researchers who are interested to conduct study related to this problem.

Literature review

Magnitude of medication administration error

Medication safety issues are an important portion of the medication use process in hospitals. Medication Administration Errors (MAEs) are the most common medical errors in health care settings. They harm patient safety, mortality rates, duration of hospital stays, and related costs. Estimating the prevalence of medication errors globally is difficult due to the varying definitions, classification systems employed and lack of good data in many countries, which will be gathered as part of quality health care initiative [2]. A Literature reviewed systematically on medication

administration errors in United States of America concluded proportion of medication error that reach to the patients ranges between 58% and 79%. Recent study in USA discovered 84.7% of medication errors occurred during medication administration and 6.2% occurred during monitoring stage, wrong time, wrong dose, and documentation errors were the most frequent inaccuracies noted during medication administrations. A study conducted by American Association of Critical-Care Nurses in 2011 revealed incidence of medication administration error in critical care unit were estimated in range 3.3% to 72.5% with most prevalent error of wrong dose, drug omission and wrong time administration. An estimated 237 million medication errors occur at some point of medication process in England over one year. This was the sum of the errors occurring at all stages of medication use with administration error of 54.4%.

In a study conducted at two Dutch hospital ICUs medication administration error were 44.6% with a specific error prevalence of wrong time administration (39.55%), administration technique error (28.75%), wrong dose (17.8%), omission error (9.5%) and unordered drug error (4.1%) respectively. Prospective observational study conducted on six ICU wards of two Vietnamese hospitals showed prevalence of medication preparations and administrations error were 39.1% with the most frequent errors of wrong administration technique (23.5%), followed by wrong preparation technique (15.7%), omission (2.3%), and wrong dose (1.8%) respectively. According to a study conducted at large teaching hospital of Iran the incidence of medication error in ICU were 9.8% with the most prevalent medication error occurring at administration and prescription stage respectively. A systematic literature revised in Southeast Asian countries reported medication administration error range from 15.22% to 88.6% with the most frequent error of wrong time, omission error and wrong dose respectively. According to a study conducted in southern India frequency of medication administration errors were found as 15.24% with specific error of omission error 33.02%, wrong dose 17.43%, wrong drug 05.50%, wrong route 01.83%, wrong rate: too fast 08.25%, and wrong time 12.84%.

Medication error is relatively common in Africa setting, a systematic literature reviewed on 9 countries of Africa Hospital conclude at least one medication administration error has been reported in a median of 56.4% (IQR: 39.5–87.5%) of all medication administration observations. According to South Africa Critical Care Society report in 2014 nurse related medication errors in ICU were 12.49% with specific error of missed or incorrect doses (6.21%) and wrong medication administration 5.28%. A study conducted at Kenyatta national hospitals critical care unite of Nairobi showed that 43% of nurses were experienced medication administration with the most prevalent error of drug omission (64.1%), wrong patient (28.1%) and un ordered medication (23.2%) respectively. In Ethiopia study discovered higher prevalence of medication administration error. The study conducted in west Ethiopia at Nekmet referral hospital pediatrics ward concluded 75.1 % of

pediatrics patients were exposed to medication errors, from those 4.6 % patients developed ADEs.

Recent study conducted in northern Ethiopia of Tigray public hospital among pediatrics patient prevalence of medication administration error were 62.7% with specific prevalence of wrong dose (85.4%), administering in wrong time (55.1%), medication omission (2.3%), administering to wrong patient (0.6%), administering via a wrong route (0.5%), administering un-prescribed medication (0.3%) and administering wrong drug (0.1%). According to a study conducted at Felege Hiwot hospital in Bahir Dare the incidence of medication administration error were 56.4 %, with majority 87.5 % of medications having documentation error, followed by technique error 73.1 % and time error 53.6 % respectively.

A study conducted in two public hospitals of southern Ethiopia concluded 71% nurses committed MAE within 12 month duration prior to the study. 46% of them committed it at least four times while 35% of them committed it two or three times during the specified period. But 99.3% of directly observed nurse while they administer medication were committed at least one type of error with most frequent error of documentation, time and route error respectively. A study conducted at Jimma University Hospital ICU concluded 51.8% medications were labeled as medication administration errors with a common error of wrong timing (30.3%), omission due to un-availability (29.0%), and missed doses (18.3%).

Factors associated with medication administration error

Medication errors are human actions, it essential to understand the mechanism that errors develop and conditions that influence error occurrence to develop intervention that deal with this phenomena. Lack of therapeutic training, inadequate drug knowledge and experience, overworked or fatigued health care professionals, Patient characteristics (complexity of clinical case, including multiple health conditions, polypharmacy and high-risk medications), distractions and interruptions (by both primary care staff and patients), lack of standardized protocols and procedures, insufficient resources and lack of accuracy of patient records were the key factor associated with MAE described by WHO in 2016. Study conducted in United States of America showed lack of knowledge (39%), lack of resource availability (7%), nurse-patient ratio (37%) destruction of Nurse during time of medication administration, lack of experience and working prolonged time (more than 12 hour) were the major cause of medication administration error. Other study conducted by American associations of critical care suggested distractions, high workload and lack of drug knowledge may contribute to medication errors. According to a study conducted at governmental hospitals of Malaysia the three top causes of medication administration error were heavy workload, complicated orders and new staff. Study in Vietnamese Hospitals ICU showed much higher error rates were observed for intravenous medications than for oral ones (73.2% vs. 11.8%), and within IV medication higher error rates were observed for medications involving complex preparation

procedures than for simple intravenous ones (90.2% vs. 53.9%). According to a study conducted in Iran insufficient staff management, inadequate number of nurses, increased working shifts, stress and heavy work load, multiple underline patient condition, interruptions during medication administration, lack of the nurse's pharmaceutical knowledge, lack of physician and nurses' communication with patients or their families were identified as a cause of medication administration error in ICU.

A systematic literature revised in Southeast Asian countries concluded top factor associated with MAE were staff shortage/ high workload, nurse/doctor distraction, incorrect interpretation of prescription/medication chart, lack of knowledge and lack of experience. According to a study conducted in southern India Lack of Lighting, high Noise level, frequent interruptions and distractions, lack of training, lack of staffing, were found to institutional factor causing medication administration error and nursing factor associated with medication administration error were knowledge deficit, stress, fatigue/ lack of sleep and poor communication among health care professionals. A study conducted at kenyatta national hospital general critical care unit of Nairobi showed delay in receiving medication from pharmacy (91.1 %), lack of medication (90%), lack of equipment's like infusion pumps (88.9 %), taking care of more than one patient (66.7%) and single nurse medication administration 60%, were perceived as the major factors that affect medication administration practice, nurse with BSc degree and above were less likely to be encountered with new medications in their line of practice than diploma holders, institutional medication administration processes, Patient characteristics and Nurses experience and qualifications have moderate effect on medication administration [3]. A study conducted at Felege Hiwot Hospital revealed age of the respondents and the patient, nurse's working experience, interruption of the nurses at the time of medication administration, shift of medication administration, and nurse to patient ratio were found to be significantly associated with medication administration error, Nurses with the age group of 18–25 years and 26–40 years were 3 times and 2 times more likely to make medication administration error respectively as compared to those with the age greater than 40 year.

Nurses who had work experience of less than or equal to 10 years were 2 times more likely to make an error when compared to those who had experience greater than 10 years. Nurse to patient ratio was also found to be one of the strong indicators of MAE. Respondents who had nurse to patient ratio of 7–10 and greater than 10 were 2 times and 3 times more likely to make an error respectively when compared to nurse to patient ratio of 1–6. Nurses who face interruption during medication administration were 2 times more likely to make medication administration error as compared to those who administered without interruption. In addition, nurses who were administering medication at night were 3 times more likely to made medication administration error when compared to those who were administering medication during the day. Patients less than 18 years of age were 2 time more likely to

face medication administration error than as compared to those with the age greater than or equal to 18 years. A study conducted in two public hospitals of southern Ethiopia concludes lack of sufficient training (68.5%), inadequate staffing (66.9%), and distraction (50.8%) were the three most commonly listed factors for medication administration error.

Objectives

General objective

The general objective of the study was to assess magnitude of medication administration error and associated factors in adult intensive care units of federally administered public Hospitals in Addis Ababa.

Specific objectives

To determine magnitude of medication administration error in adult intensive care units of federally administered public hospitals in AA. To identify factors associated with medication administration error in adult intensive care unit of federally administered public hospitals of AA.

Study area and study period

The study was conducted at public hospitals in AA city. Addis Ababa is the capital city of Ethiopia and seat for Africa Union. It is the largest city in Ethiopia, with a population of 3,475,952 according to the 2007 population census with annual growth rate of 2.7 %. Its area is estimated to be 530Km² with altitudes ranging from 2200 to 3000m above sea level, average temperature of 22.8C° and average rainfall of 1,180.4mm. People from different regions of Ethiopia populate the city. Addis Ababa has 41 hospitals (14 public and 28 NGO and private) Out of 14 public hospitals: five (Tikur-Anbessa Specialized hospital(TASH), St. paul's hospital, Addis Ababa Burn, Emergency and Trauma hospital, St. peteros hospital and Alert hospital) which are administered by federal institution was included in this study.

Study design

An institution based cross-sectional study was conducted in adult ICU of federally administered public hospitals of AA.

Source populations

For this study the source populations were all medication administration intervention to patient admitted in adult ICU of federally administered public hospitals in AA.

Study populations

The study populations were all medication administration intervention to patient admitted in adult ICU of randomly selected federally administered public hospitals in AA.

Inclusion criteria

All medication administration intervention to the patient admitted in adult ICU of federally administered public hospitals in AA.

Exclusion criteria

Over countered drugs.

Data collection tool and procedure

Data on medication administration were collected by directly observing nurse while administering medication using checklist supplemented with self-administered questionnaire to gather nurse socio-demographic and experienced related data and by reviewing patient chart to gather patient related data. Immediately after observation, data on recorded observation were compared with the physicians order by referencing patient's chart. The content of data collection formats were design to record nurse's demographics and work experience and all data regarding the patient's medication intervention, date and time that specific drug was prescribed and administered, including the name of the drug, dosage given, frequency, and route of medication administration. Data were collected through 24 hours both in working time and night duty time. Questionnaire and checklist were developed from previous studies conducted at Kenya, feleg hiwot hospital, British journal of nursing and fundamental of nursing skill lab manual prepared by Ethiopian public universities, with slight modification [4]. Data collection was by 6 BSC nurse and supervision were carried by 2 MSC nurse.

Operational definition

Medication: a chemical substance intended for use in the diagnosis, treatment, cure, mitigation, or prevention of a disease. Commonly known as drugs.

Medication administration: The process of preparing, giving, and documenting medicines. In administration, the nurse ensures that right dose of the right drug is administered to the right patient at the right time by the right route.

Medication administration error: a discrepancy between the drug received by the patient and the drug therapy intended by the prescriber.

Adverse drug Reaction: unintended response, which includes intolerance, and abnormal reaction, Characterized by rash, itching, Fever, and if severe can lead to organ damage and death.

Poly pharmacy: patient taking 5 or more medication at a time.

Omission error: Drug ordered and not administered.

Unordered drug error: Drug administered but not ordered.

Wrong route error: Drug given by wrong route of administration, for example, a parenteral drug given intravenously instead of intramuscularly.

Wrong administration technique error: Drug administered using the wrong technique, for example too rapidly or too slowly.

Data processing and analysis

Data were entered into EPI-data version 4.1 computer programs and exported for analysis to SPSS version 25. Cleaning, analyzing was done by SPSS. To explain the study population in relation to relevant variables, descriptive statistics such as frequencies and percentages were calculated. Logistic regression analysis was done to identify the association between dependent and independent variables.

Data quality assurance

The quality of data was assured through careful design and pretesting of questionnaire. Before the actual work, provision of intensive training for one day about the objective of the study, checklist, procedures of observation, methods of reporting to supervisors and principal investigator were carried out. Before collection of the actual data questionnaire were tested for appropriateness on 5% of the sample in adult ICU of minilic II hospital. Data were checked frequently during collection, collected questionnaire and checklist were examined for completeness and consistency at the end of each day of the data collection. The study result would be presented to Addis Ababa University, college of health science, department of emergency medicine and critical care. After presentation the document would be disseminated to each federally administered public hospital and ministry of health. Furthermore, the finding would be presented on appropriate seminars, conferences and workshops and will be published with scientific journals.

Ethical consideration

Ethical clearance was obtained from departmental research ethical review committee of Addis Ababa University, college of health science, department emergence medicine and critical care prior to beginning of the study. Letter of cooperation to secure permission of access was given to selected hospital ICU Nursing department head. Names and other identifying data of respondents were eliminated throughout the study process to maintain confidentiality. Medication safety issues are an important portion of medication use process in hospitals. Medication Administration Errors (MAEs) are the most common medical errors in health care settings [5]. They harm patient safety, mortality rates, duration of hospital stays, and related costs. This study determined the prevalence of medication administration error occurred in federally administered adult ICU of Addis Ababa public hospitals,

Ethiopia. From the total of 419 medication administrations interventions, 256(61.1%) had at least one type of medication administration error. Medication administration errors in this study were higher as compared to a previous finding reported by a study involving 205 ICUs in 29 countries (46.0%).

Conclusion

In conclusion medication administration errors in adult intensive care unit of federally administered public hospital were highly prevalent. More than three fourth of the patient admitted to ICU were exposed for at least one type of MAE. Technical error was the most frequent error followed by wrong time and documentation error. Interruption during the time of medication administration, nurse to patient ratio and shift of medication administration were institutional factor predictive for medication administration. Polypharmacy and working experiences was patient related and nurse related factor associated with medication administration respectively.

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