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Review Article

Diversity in prescription and medication errors

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ABSTRACT

This study is intended to estimate the types of medication errors, factors and cause of prescription errors as well as medication errors and prescription errors prevailed in hospitals. Prescription drugs are killing far more people than illegal drugs and even Times analysis of 2009 death statistics showed more people were killed by drugs than motor vehicle accidents in US. In June 2010 report in Journal of General Internal Medicine, the author said that in looking over reports spanned from 1976-2006 they establish that, of 62 million death certificates about quarter-million deaths were coded as having occurred in a hospital setting due to medication error. An estimated 4, 50,000 preventable medication- related adverse drug events (ADEs) occur in US every year. Medication errors were estimated to account for more than 7,000 deaths annually in India. Harm from medications can arise from unintended consequences as well as medication error. This current study emphasize the importance of severely reducing the medication errors, improving communication with patients, reducing misreading of prescriptions, misinterpretation of adverse drug reactions (ADRs) and improving and standardizing medication labeling and drug related information.

Key words: Prescription drugs, Medication errors, ADEs, ADRs, Prescription errors

INTRODUCTION

Prescription is a 'written order from a registered medical practitioner, or new properly certified practitioners, such as dentist, veterinarian etc to a pharmacist to composite and distribute a specific medication for the tolerant.' The order is escorted by guidelines for the pharmacist to prepare a specific type and quantity of preparation for a patient .The prescription also includes the directions for the patient regarding the mode of administration of drugs, which is dispensed for him.[1] A Medication is [a product that] contains a compound with proven biological property, plus excipients, or excipients solitary; it may also contain contaminants; the active compound is usually a drug or prodrug, but may be a cellular element.[2] Medication Error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in control of health care expert, tolerant, or consumer. Such events may be related to professionals practice, healthcare products, actions, and systems, including prescribing; order communication; product labeling, wrapping and naming; compounding; dispensing; distribution; administration; education; monitoring; and use.[3] Prescribing Faults are the failure in the prescribing (decision-making) process that leads to, or has the potential to harm to the patient.[4, 5]

Prescribing is:

1. The process of deciding what to prescribe and naming it.
2. The act of writing the prescription.[5]

Prescription Error is a 'failure in the prescription writing process that results in a wrong instruction about one or more of the normal features of a prescription'. The 'normal features' include the identity of the recipient, the identity of the drug, the drug formulation, dose, route, timing, frequency and duration of administering a drug.[5]

Prescription is:

1. Act of writing a prescription
2. The prescription itself.

ADRs are an undesirable response associated with use of a drug that either compromises therapeutic value, enhances toxicity, or both.[6]ADRs being capable of manifested as diarrhea or constipation, rash, headache, or other nonspecific symptoms. One of the challenges presented by ADRs is that prescribers fail to recognize the patient's age or number of medications as a contributing factor. ADEs are defined as "any response to a drug which is noxious and unintended and which occurs at doses normally used for prophylaxis, analysis or treatment of disease, or the

change of physiological function, given that this noxious response is not due to medication error."

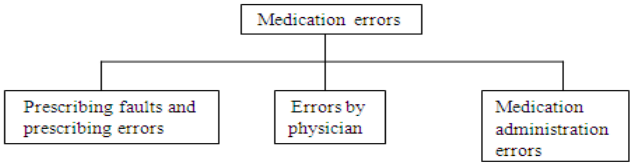

Figure1 - Types of medication errors

An analysis of 108 reports associated with significant harm or death reported to the States of New York noted that, when the errors occurred during the prescribing stage, written prescription accounted for 74 percent of the error.7

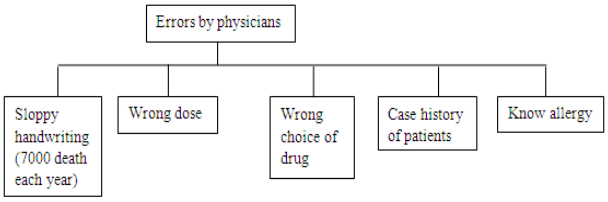

Figure 2 - Flowchart showing frequent errors made by physicians

A misread prescription can lead to mistreatment and cause death. Accidental death from prescription drugs, yet when they are properly specified, is now the fourth foremost reason of fatality in US.[35]Well over 1, 00,000 Americans die every year from ADRs to prescription drugs and that drug side effects are a leading cause of death in the U.S.(SEE " the FDA's twisted policy," this issue, pp 104-105)''It might be that the doctor is focusing on the diagnosis and medication more than on writing the prescription," argues Keya Shivadey, specialist Gynecologist and Obstetrician at Aster Medical Center. More than 100 doctors gathered in the state of Maharashtra, India in 2012 to make a statement; bad handwriting of a physician is harmful. Infect, the Institute of Medicine (IOM) reported that the sloppy handwriting of physicians is responsible for 7,000 deaths each year.[8] Out of 91,574 patients admitted to a single hospital over a three-year period, 2.43 percent (2,227) experienced ADEs. The worst thing that can happen to you is ''cascade of prescribing'' where you need a half dozen strong drugs to undo the side effects of the first one, and then a lot of time to recuperate from the effects of all of them.[35] Medications with complex dosing regimens and those given in specialty areas (e.g., intensive care units, emergency department, and analytic and interventional area) are associated with increased risk of ADEs.[7] Phillips and collegues[9]found that deaths (the most severe ADEs) associated with medication errors involved central nervous system agents, antineoplastics and cardiovascular drugs. Most of the common types of errors resulting in patient death involve the wrong dose (40.9%), wrong drug (16%), and wrong route of administration (9.5 percent).

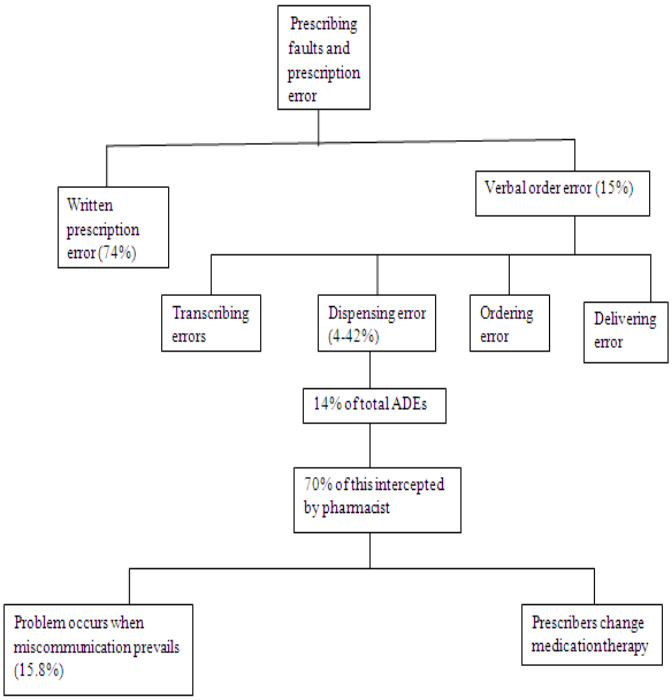

Figure 3 - Flowchart classifying prescription errors and prescribing

In one case reported to the Institute for Safe Medication Practices (ISMP), a doctor called in a prescription for the antibiotic Noroxin (Norfloxacin) for a patient with a bladder infection. But the pharmacist considered the order was for Neurontin (Gabapentin), a drug used to treat seizures. The fine information is that the patient interpret the medication leaflet stapled to his prescription bag, noticed the drug he acknowledged is used to treat seizures, and then asked about it. But what would be happened to 80 percent cases where patients have no idea about their medications so prescribed. Since 1992, the food and drug administration has received almost 30,000 reports of medication errors. These are voluntary reports of medication errors that actually occur is thought to be much higher. In 1995, the food and drug administration established the Black Box Warning (BBW) system to alert prescribers to drugs with increased risks for patients. These warnings are intended to be the strongest labeling requirement for drugs or drug products that can have serious adverse reactions or potential protection hazards, particularly those that may result in death or serious injury. 10 One study funded by the Agency for Healthcare Research and Quality found 40 percent of patients were taking a medication with a BBW and that many of those patients did not receive the recommended laboratory monitoring. A survey of patients discharged from the hospitals found that about 20 percent were concerned about an error with their medications, and 15 percent of them were concerned about being harmed from mistakes by nurses compared to 10 percent who were concerned about mistakes by physicians. It is difficult to reduce or eliminate medication errors when information on their prevalence is absent, inaccurate or contradictory. Most medication errors cause no patient harm or remain undetected by the

clinician. The low rate of detected errors makes assessing the effectiveness of strategies to prevent medication errors challenging. Rates of medication errors vary, depending on the detection method used. For example, among hospitalized patients, studies have shown that errors may be occurring as frequently as one per patient per day.[35] Studies suggest that errors and resulting adverse events are common in intensive care units (ICUs). The incidence may be as high as 2 errors per patient per day; 1 in 5 ICU patients may sustain a serious adverse event, and virtually all are exposed to serious risk for harm.[35] The impact of medication errors on morbidity and mortality were assessed in a case-control analysis of ADEs in hospitalized patients throughout a 3-year period. 16 The investigators establish major increases in:

a) The cost of hospitalization from increased duration of reside, ranging commencing $677 to $9,022:
b) Patient mortality
c) Post discharge disability.

The impact was less in male patients, younger patients, and patients with less severe illnesses and in certain diagnosis-related group's .The concern continues, as is seen in the most recent IOM report, Preventing Medication Errors, which states that "a hospital patient is subject to at least one medication error per day, with significant difference in mistake rates across amenities". The early research on medication administration reported an error rate of 60 percent, mainly in the form of incorrect time, incorrect rate, or incorrect dose. The most frequent types of medication errors were wrong time (33.6%), wrong dose (24.1%), wrong drug (17.2%) , wrong patient (19.0%) , and missed doses (7%). 17 Three observational studies were conducted in pediatric units- one in France[18], one in Switzerland[41] and one in the United States[40]. Buckley[40] reported 52 of the 263 doses (19 percent) observed to be in error, but only 15 (6 percent) of those were in the administration stage. Those 15 were nearly evenly divided among wrong dose, wrong time, wrong technique, and extra dose categories. Prot[18] reported nearly evenly 50 percent more MAEs. Of the 1,719 observed doses, 467(27 percent) were in error, including wrong time: excluding wrong time errors, the error rate was 13 percent of doses. The categories with the most MAEs in Prot's study were wrong time, wrong route (GI tube versus oral), wrong dose, unordered drug, wrong form, and omissions. Schneider and colleagues[41] reported an overall 26.9 percent error rate with wrong time errors, and an 18.2 percent rate excluding wrong time errors. Common errors in addition to wrong time were wrong dose preparation and wrong administration technique.

Table 1 – Most frequent medication errors

Most frequent medication errors	Percentage
Wrong time	33%
Wrong drug	17%
Wrong dose	24%
Wrong patient	19%
Missed doses	07%

The incidence of intravenous drug errors was observed in three studies, one in England [19], one in Germany [20], and one in both countries. [21] About 50 percent of the doses were determined to contain at least one error. Compared to other studies, this rate is surprisingly high, and it included preparation technique errors (selection of diluents/ solvent) as well as administration errors (rate of bolus injection and infusion rate). Part of the explanation may come from institutional (type of pharmacy support available) and professional training factors. (German nurses are not trained to do intravenous medications.) Three studies focused on medication administration in ICUs in the United States [22], in France [23], and in the Netherlands [24]. Kopp and colleagues [22] looked at all medication errors and report that 27 percent of doses were in error; of these 32 percent could be attributed to the administration stage. Within the MAEs, most were omitted medications; the rest were evenly distributed among wrong dose, extra dose, and wrong technique. Few wrong time errors were noted. Tissot[23] and Van den Bernt[24] examined only administration stage errors and reported very different rates. Tissot reported 6.6 percent of the 2009 observed doses were in error, most from wrong dose, wrong rate, and wrong prescription technique. Excluding wrong time errors, van den Bernt reported a 33 percent error rate that included preparation errors with diluents/ solvent issues, infusion-rate errors, a d chemical incompatibility of intravenous drugs. It is likely that the differences in rates across these studies are due to the range of error types observed in each study as well as the varying responsibilities of nurses in the three countries. The most extensive observation study, by Banker and colleagues, [25] conducted observations of medication administration in 36 randomly selected health care facilities (acute and long-term care) in two States in the United States. Of the 3,216 doses observed, 605 (19 percent) contained at least one error. Nearly half of those errors were wrong time errors. Other common types of errors included omission, wrong dose, and unauthorized (unordered) drug. In a much smaller study conducted in the Netherlands, Colen, Neef, and Schuring [26] found an MAE rate of 27 percent, with most of these wrong time errors. The rate of MAEs without wrong time was approximately 7 percent, and most of these were omissions. Information from these research studies forms a consistent picture of the most common types of MAEs. These are wrong time, omission, and wrong dose (including extra dose). Rates of error derived from direct observation studies ranged narrowly between 20 and 27 percent including wrong time errors. The alarming exception to this was the nearly 50 percent error rates in observation of intravenous medication in ICUs in Europe. Almost half of fatal medication errors occurred in people over 60 years because they often take manifold medications. Children are also a vulnerable populace because drugs are often dosed based on their weight and accurate calculations are critical. Nurses are not the only ones to administer medications. Physicians, certified medication technicians, and patients and family members also administer medications. Part of the challenge in understanding the impact of nursing in medication

administration is the need for research that clearly differentiates the administration of medications. Among many reasons for the prevalence of nurse involvement in medication errors is that nurses may spend as much as 40 percent of their time in medication administration.[27] A review of incidental reports found that the major contributing factors to errors were unproven staff, followed by inadequate staffing, agency/ provisional staffing, lack of access to patient information, crisis condition, deprived lighting, patient transfer, balanced staff, no 24-hour pharmacy, and convention situation. [28]

It is studied from the reviews of literature that nurses are not skilled enough in computerized programs and poor mathematical skill especially if these were needed to properly administer drugs.[27,29,30]

There are five stages of the medication process;

- Ordering/prescribing
- Transcribing and verifying
- Dispensing and delivering
- Administering
- Monitoring and reporting or discharge summaries

Hospitalized patients suffer preventable injury or even death as a result of ADEs associated with errors made during the prescribing, dispensing and administering of medications to patients, although the rates of error in the stages of medication process vary. A few studies have indicated that one of every three medication errors could be attributed to either a lack of knowledge about the medication or a lack of knowledge regarding the patient. [30]

Table 2 - Criteria for medication errors[31]

Stage	Definition	Error types
Ordering	Unambiguous prescription	Omission of: Drug name, drug formulation, route, dose, dosing regimen, date, sign, treatment time for antibiotics i.e. Errors committed in this stage include illegible and / or incomplete orders, orders for contraindicated medications and inappropriate doses.
Transcribing	An identical copy of the prescription in medical record	Discrepancy in: Drug name, drug formulation, route, dose, dosing regimen, omission of drug, and unordered drug Unordered dose, omission of dose, wrong dose, wrong drug formulation.
Dispensing	Dispensed medication is concordant with prescribed drug in nurse medication chart	Wrong administration technique (injection), route, time (+/- 60 min), delivery (dose not delivered directly to the patient), unordered drug, unordered dose, omission of dose, and lack of identity control.
Administering	The right medication to the right patient in the right way and at the right time	Discrepancy in: Drug name, drug formulation, route, dose, dosing regimen, omission of drug, and unordered drug
Discharge summaries	Eligible prescriptions in medical record are identical to prescriptions in discharge summaries	

Every day in US 25,000 youth (12-17 year) abuse a prescription pain reliever for first time .It is problem while most prevalent in US, is a problem in many areas including Europe, South Africa and South Asia.[32] Prescription drug abuse causes the largest percentage of deaths from drug overdosing.[32]

Table 3 - Table showing drugs mostly abused

Drugs commonly abused	Frequency (in millions)
Pain relievers	5.1
Tranquilizers	2.2
Stimulants	1.0
Sedatives	0.4

Causes and factors associated with medication errors and prescribing faults and prescription errors:

- Combined drug intoxification also known as multiple drug intake or lethal polydrug or polypharmacy intoxification. It is due to the simultaneous use of multiple drugs whether the drugs are prescription, OTC, recreational or some other combination (herbal mixtures, ingestion of alcoholic beverages etc.)
- Instead of lowering the dose of the offending drug or replacing it with a safer alternative, the physician adds a second drug to regimen to treat the adverse drug reactions.
- Misinterpreted handwriting of prescription.
- Poor communication between physicians and nurse or pharmacist and physician.
- Lack of patients understanding about a drug's directions.
- Lack of employee knowledge.
- Similar or misleading container labeling.
- Working conditions of hospital can facilitate medication errors such as high noise levels, excessive workloads, and system interventions, such as the need for computerized order entry, unit dose (e.g. . single-dose packaging), and 24-hour pharmacy coverage.
- Drug information that is not effortlessly reached or up to date.
- Confusing directions.
- Incomplete patient medication history.
- Unknown patient allergy.
- Lack of redundant safety checks.
- ''Cognitive errors'' under conditions of uncertainty and time pressure, such as incorrect diagnosis or choosing the wrong medication gives rise to three basic principles:
    - 'Anchoring' where person overvalues the first data he encounters and so is skewed in his thinking.
    - 'Availability' where recent or dramatic cases quickly come to mind about the situation at hand.
    - Attribution' conclusion arises not from the data but from preconceptions.

- The three most significant barriers to recognizing and reporting medication administration errors were:
    - A hierarchical hospital customs/ organization where the nursing staff disagreed about the definition of reportable errors
    - Fear of the feedback and retort of hospital management or administrators and peer to a reported error
    - The amount of time and effort involved in documenting and reporting an error.
- Drug name confusion eg.
    - Altocor and Advicor both are cholesterol-lowering medicine
    - Serzone (Nefazodone) for depression and Seroquel (Quetiapine) for Schizophrenia
    - Taxotere (Docetaxel) and Taxol (Paclitaxel), in cooperation for chemotherapy
    - Celebrex (Celecoxib) for Arthritis and Celexa (Citalopram) for depression.

RESULTS

In a June 2010 report in the Journal of General Internal Medicine, study author said that in looking over reports spanned from 1976 to 2006 (the most recent year available) they establish that, of 62 million death certificates, roughly quarter-million deaths were coded as having occurred in a hospital setting due to medication error. [33] According to the report of Institute of Medicine (IOM) in 1999, between 44,000 and 98,000 deaths each year from medical errors in hospitals alone [35] and more than 7,000 deaths each year are interrelated to medications. [34] Between 2001 to 2008, there was a 36 percent increase in hospital admissions and 28 increases in emergency room visits, among children 5 and younger who had accidently ingested prescription of opioid painkillers, such as Oxycodone, augmented 101 percent.[36] In 2005 opioid painkillers were the most commonly found drug, accounting for 38.2 percent of deaths. In 2005, 4.4 million teenagers (12-17 years) in US admitted to take prescription painkiller and 2.3 million took a prescription stimulant such as Ritalin while 13-14 year 2.2 million teenagers abuse OTC drugs such as cough syrup.[32] In 2006 in US 2.6 million people abuse prescription drugs for the initial time.[32] In 2009, there were nearly 4.6 million drug-related visits to US emergency room nationwide with more than half due to adverse reactions to prescription medications most of which were being taken exactly as prescribed. [38] In 2012 doctor's handwriting causes 7,000 deaths a year reported by UAE and Institute of Medicine (IOM) [35] As written in Baltimore Sun[39] " According to the White House office of National Drug Control Policy, prescription drugs are next to Marijuana as the drug of choice for today's teen. Infact seven of the top ten drugs used by 12th graders were prescription drugs. Further 40 percent of high school seniors reported that painkillers are "fairly" or "very easy" to get. They also reported that they believed that if they were to get trapped, there was less shame attached to the utilization of prescription drugs than to street drugs. This reflects the perception of their parents, who when queried believed that they feel prescription drugs were a safer alternative to drugs typically sold by a drug dealer." The impact of medication errors on morbidity and mortality were assessed in a case-control analysis of ADEs in hospitalized patients during a three year period. [16] The investigators found significant increases in; a) The cost of hospitalization from increased length of stay, ranging from $677 to $9,022. b) Patient mortality and c) Post discharge disability. The impact was less in male patients, younger patients, and patients with less severe illnesses and in certain diagnosis-related groups. The costs of ADRs to society are more than $136 billion annually-greater than the total cost of the cardiovascular or diabetic care. [33] The reason there are so many adverse drug events in US is because so many drugs are used and prescribed and patients receive multiple prescriptions as varying strength, a number of of which can counteract each other and cause more severe reactions when united.[33]

DISCUSSION

Prescribing cascade begins when an adverse drug reaction is misinterpreted as a new medical condition, another drug is prescribed and the patient is placed at the risk of additional adverse effects then a lot of time is needed to recover from the effects of all of them. Harm from medications can arise from unintended consequences as well as medication error. This study covers the extent of t he problem of medication errors, prescribing errors and ADEs, the phases of the medication-use process vulnerable to error, and the threats all of this poses for patients. The misuse of prescription drugs, leading to damage and fatality, represent a "serious medical problem" that "urgently" requires attention, according to "Archives of Internal Medicine" Nurses the most involved at the medication administration phase, although they provide a vital function in detecting and preventing errors that occurred in the prescribing, transcribing and dispensing stages. This research addresses the badly needed strategies to reduce the medication and prescribing errors saving precious human life.

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