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REVIEW ARTICLE

A REVIEW ON MEDICATION SAFETY

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ABSTRACT

Medicines are used by patients to control or cure their diseases and ailments. Drug therapy is becoming more and more complex with the introduction of new medicines and newer techniques in healthcare. Errors that are occurring during prescribing, dispensing, administration of medication and in patient compliance is known as medication errors. They can sometimes cause serious adverse effects in patients, including impairment and death. Medication errors are defined as any mistake at any stage of the medication use process: selection and procurement, storage ordering and transcribing, preparation and dispensing, administration or monitoring. Every error in drug therapy is potentially harmful to human and also increase the treatment cost. It is believed that improved health systems and providing individual care can help to avoid medication errors. Medication safety has attracted the attention of Government regulatory agencies, including The Joint Commission. Medication errors occur due to communication failure, confirmation bias, defects in drug distribution, miscalculation of doses, wrong drug administration and poor patient education. Medication errors are a public health issue. Pharmacists should know our responsibilities and work hard to make medication use safe for our patients. The goal of medication therapy is to achieve desired therapeutic outcomes so as to provide better quality of life to the patient (World Alliance for Patient Safety, 2006; The Institute of Medicine, 2006; KaufmanM 2005).

INTRODUCTION

Preventable medication-related adverse events continue to occur in the healthcare setting. The lack of progress may be related to the myriad of pharmaceutical options now available and the nuances of optimizing drug therapy to achieve desired outcomes and prevent undesirable outcomes. However, on a broader scale, there may be opportunities to focus on the design and performance of the many processes that are part of the medication system. Errors may occur in the storage, prescribing, transcription, preparation and dispensing, or administration and monitoring of medications. Each of these nodes of the medication system, with its many components, is prone to failure, resulting in harm to patients. The pharmacist is uniquely trained to be able to impact medication safety at the individual patient level through medication management skills that are part of the clinical pharmacist's role, but also to analyze the performance of medication processes and to lead redesign efforts to mitigate drug-related outcomes that may cause harm.

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One population that can benefit from a focus on medication safety through clinical pharmacy services and medication safety programs is the elderly, who are at risk for adverse drug events due to their many co-morbidities and the number of medications often used (World Health Organization, 2008; Kaufman, 2006; Kessler, 2013; Zachary *et al*., 2010).

Medication errors

Medication errors are defined as any mistake at any stage of the medication use process: selection and procurement, storage ordering and transcribing, preparation and dispensing, administration or monitoring .All medication error is preventable by determining the potential underlying causes in the medication- use system and correcting them. Medical mistakes that cause harm have a devastating effect on patients in the healthcare system. The goal of medication therapy is to achieve desired therapeutic outcomes so as to provide better quality of life to the patient (Paul *et al*., 2006; NICE, ?; Blum,1988; Smith, 2005; Kuchake *et al*., 2008). From the point of view of practicing pharmacist, medication errors are classified into three major groups.

- Prescription centered medication errors.
- Medication administration errors.
- Dispensing centered medication errors.

Prescription centered

Inadequate knowledge about drug indications, contraindications and drug interactions will cause numerous problems in patients. So, health care professionals should be given alternative ways of accessing drug information because it is not always possible to remember all the relevant details necessary for safe prescribing. Often doctors fail to take medical history of patients due to their busy schedule. Especially in case of renal or hepatic impaired patients, lack of taking medication history can lead to serious adverse drug effects (The Institute of Medicine, 2006; http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/npsg_facts.htm; Revikumar, 2012).

Administration errors

- Patient centered
- Nurse centered

Patient centered

This error arises due to a drug being given to a wrong patient at the wrong time, in the wrong dose. Patient factors: Polypharmacy, patients who cannot communicate well, e.g.: unconsciousness, babies and young children, patients who are consulting more than one doctor, patients who do not take interest in being informed about their health and medicine.[15,23]

Nurse centered

If a drug administered to a patient is not being recorded, another staff member may administer the same resulting in overdose to the patient http://www.nccmerp.org/medErrorCatIndex.htm; Amanda *et al*., 2008)

Dispensing centered: Dispensing of one patients medication to one another. Wrong mixing, compounding and wrong directions. Dispensing date expired items. Lack of interest, experience, and poor communication (Cisneros, 2012; Schneider, 2012).

What are some of the ways to make medication use safer?

Use generic name: Medications are available in trade name and a generic name. Medication safety can be ensured to a large extend by promoting the use of generic medicines. Before prescribing a medication, always think about patient conditions like-Allergies, Pregnancy, Breastfeeding, Ask about dietary supplements and complimentary medicines, Consider drug interaction, Alert the patient and other staffs, Encourage patients to be actively involved in their own treatment care and the medication use process, Educate and communicate patients about their medication and discuss among them about the ADR. Information can be both verbally and in written form. It should include; Name of the medicine, Purpose and action of the medication, Precautions and common side effects of the drug, What to do if a dose is missed, Expected duration and benefit of the treatment (Kessler, 2013).

Causes of medication error: -Communication failure- It can occur due to ambiguous order, confusion of medicines name, poor and unclear prescriber handwriting.

-Confirmation bias- There is many brand names that look alike and sound alike causing a medication error. Due to use of unrecognized abbreviations, medication errors have occurred often.

-Defects in drug distribution- Poor distribution practices like improperly packed or labeled containers and syringes and insufficiently trained personnel being granted access to medication. –Miscalculation of doses: It is more in the case of pediatrics patients taking IV administered medications, Wrong drug administration and Poor patient education (Feinberg, 1993; Koper *et al*., 2013).

Medication safety: Medication safety has become a priority in healthcare organization across the country. Medication safety has attracted the attention of Government and regulatory agencies, including The Joint Commission [TJC] and Centre for Medicare and Medical service [CMS]. These organizations have revised their standards to emphasize a systematic approach to identify and prevent medication errors and adverse drug effects. Medication describes process errors and adverse drug effects describe the consequences that result in negative clinical outcomes (Amanda *et al*., 2008; Tipnis, 2013).

Role of pharmacist in improving medication safety

There are three responsibilities of hospital pharmacist for both in and out patient. They are as follows;

- **Dispensing area's responsibilities**: Ensure that established policies and procedures are follows, Check for accuracy in the work of supportive personnel, Maintains professional competence, Ensure proper techniques are used in extemporaneous compounding (Blum, 1988).
- **Patient care area's responsibilities**: Inspect periodically the medication areas in the nursing unit to ensure an adequate supply of stock drugs and their proper storage, Identifies drug bought into the clinic, Assist in drug product and entity section (Blum, 1988; Revikumar, 2012; Cisneros, 2012).
- **General responsibilities**: Provide drug information as necessary to pharmacy, medical and nursing staff, coordinates overall pharmaceutical needs of the ambulatory services, Provide adequate control (Zachary *et al*., 2010).

Role of community pharmacist in medication safety

- Dispensing prescription medicines to the public, check dosage ensure the medicines are correct and safe and level it.
- Liaising with doctors about prescription.
- Supervising the preparations of medicines.
- Counseling and advising the patients on minor ailments and any adverse side effects of medicines or potential interactions with other medicines/treatment (Santos Silva, 2009).

Role of clinical pharmacist in medication safety: Prescription monitoring, medication history taking and medicines reconciliation, Communicates patient information to the physician, Assist physician to select drug product, dosage form and schedules, Patient education and counseling, Monitoring therapeutic outcome, side effects, toxicities, allergic reactions and patient outcomes (Schneider, 2012). Pharmacist can act as a powerful tool that can be employed to help patients to avoid dangerous drug interactions and adverse health effects. The pharmacist can strengthen doctor-patient relationship and this creates the role of the pharmacist as a trusted health advisor in health care management system. Pharmacist has the time and clinical expertise to make a difference in the way patients manage chronic conditions for which they are be taking multiple medication. Pharmacists play an active role in educating patients on potential side effects of their medications and finds the solution for prime questions in health care therapy that is (Paul, 2006; David, 1998).

Why to take?

When to take?

Where to take?

How to take?

A structured framework for patient consultation includes; Ask patients about existing health issues such as high blood pressure or diabetes. Discussing all medications help to prevent side effects or drug interactions. Remind patients of the role and importance of each medication (Revikumar, 2012).

Medication history: There are several reasons for taking an accurate medication history: Knowledge of the drugs a patient has taken in the past or is currently taking and of the responses to those drugs will help in planning future treatment. Drug effects should always be on the list of differential diagnoses, since drugs can cause illness or disease, either directly or as a result of an interaction. Drugs can mask clinical signs. For example, β-adrenoreceptor antagonists can prevent tachycardia in a patient with hemorrhage, and corticosteroids can prevent abdominal pain and rigidity in a patient with a perforated duodenal ulcer.

Drugs can alter the results of investigations. For example, amiodarone alters thyroid function tests. Pharmacist can take the opportunity to educate the patient about their medications. Other aspects of the medical history and examination may also be important in preventing a prescribing fault. For example, a history of chronic renal insufficiency will highlight the need for caution when introducing an angiotensin converting enzyme inhibitor. Furthermore, the effects of some drugs can be detected by examination, such as the beneficial effect of salbutamol on the peak expiratory flow rate or the adverse effects of phenytoin on the central nervous system (nystagmus and ataxia).Errors are more common on admission to hospital for many reasons: patients often are not able to report their drug history accurately and may not bring either the drugs themselves or even a recent list of medications with them. A drug prescribed in error will often not be checked until a pharmacist reviews the patient's prescription, which may not be for up to 72 h after admission.

Clearly, therefore, the medication history must be accurate at the time of admission and should be checked at the earliest opportunity during a patient's hospital stay. The medication history should not simply be a list of a patient's drugs and dosages. Other information, such as adherence to therapy and previous hypersensitivity reactions and adverse effects, should be noted and should be compared with the patient's general practitioner (GP) records or previous prescription history in their hospital case notes. Herbal remedies are infrequently recorded but may be important causes of morbidity (Best Practice, ?). The details that should be elicited in a good medication history are described below:

History from the patient: When taking the history from the patient use the words 'medicines' or 'medications', rather than 'drugs', which may be mistaken for drugs of abuse or recreational drugs. Elicit the following information:

Current prescribed drugs, formulations (e.g. modified-release tablets), doses, routes of administration (e.g. oral, transdermal, by inhalation), frequencies, duration of treatment. Other medications (e.g. over-the-counter drugs and herbal or natural remedies, such as vitamins and glucosamine).Drugs that have been taken in the recent past (important for drugs with long half-lives, such as amiodarone).Previous drug hypersensitivity reactions, their nature and time course (e.g. a rash, anaphylaxis).Previous adverse drug reactions, their nature and time course (e.g. nausea with erythromycin, peripheral oedema with amlodipine).Adherence to therapy (e.g. 'are you taking your medication regularly?'), recognizing that the information may be inaccurate (Roy, 2002; Kessler, 2013).

History from the community pharmacist

Up-to-date list of medications, previous adverse drug reactions, Last order dates for each medication.

History from case notes

Previous prescriptions, Previous adverse drug reactions.

Inspection

Drugs and their containers (for example, packs, bottles, vials) should be inspected for name, dosage, and the number of dosage forms taken since dispensed; it is often possible to identify a medicine by inspecting the formulation (Feinberg, 1993; Amanda *et al*., 2008).

Medication history errors: The scale of the problem, consequences and prediction: Errors in the medication history can be classified into omission errors (drugs missed from the history), commission errors (drugs added to the history), frequency errors, and dose errors. Cardiovascular drugs, sedatives, antibiotics, antithrombotic drugs, and analgesics were the most frequently involved in medication history errors and given the potential for adverse effects from these drugs. Examples included continued use of diclofenac in patients with upper gastrointestinal bleeding and the omission of a regular corticosteroid (prednisolone 7.5 mg day^{-1}) in a patient with acute confusion. There were no significant correlations between the time of admission (night-time, weekend) or polypharmacy and the mean error rate per patient.

Previous hypersensitivity reactions may be documented without being explored in detail. For example, a history of 'allergy to penicillin' may not represent true hypersensitivity and may lead to unnecessary avoidance of penicillin both currently and in the future. Some adverse effects (e.g. peripheral oedema with amlodipine or a transient rise in liver function tests after starting rifampicin) need not preclude use of the drug in the future. This is especially important in chronic conditions such as hypertension, in which multiple adverse effects are more common (NICE, ?; Blum, 1988).

Risk factors for errors in medication history: Polypharmacy is a logical candidate as a risk factor for errors in transcribing drugs, but the evidence is contradictory. Specific drugs, such as anticoagulants, cardiovascular drugs, non-steroidal anti-inflammatory drugs, opioids, corticosteroids, and modified-release formulations, are more likely to be subject to errors, although this may simply represent their widespread use and multiple formulations (Cisneros, 2012; Roy, 2002).

DISCUSSION

Medication errors occur frequently and have significant clinical and financial consequences. Several types of information technologies can be used to decrease rates of medication errors. Computerized physician order entry with decision support significantly reduces serious inpatient medication error rates in adults. Other available information technologies that may prove effective for inpatients include computerized medication administration records, robots, automated pharmacy systems, bar coding, "smart" intravenous devices, and computerized discharge prescriptions and instructions. In outpatients, computerization of prescribing and patient oriented approaches such as personalized web pages and delivery of web based information may be important. Public and private mandates for information technology interventions are growing, but further development, application, evaluation, and dissemination are required (Smith, 2005; Tipnis, 2015).

There are various strategies for reducing the impact of errors in the medication history (such as a more involved role for pharmacists) and for preventing errors in the subsequent transcription of the medication history (better education for prescribers).Pharmacists have been involved with medication reconciliation for several years. In the context of acute general (internal) medicine admissions, pharmacists obtain better medication histories than many physicians and also identify more medication doses and frequencies. There are also reductions in medication errors when pharmacists are involved in pre-admission clinics for elective surgery. Clearly, there is benefit from using pharmacists in acute or elective admission processes, but doing so is expensive and time-consuming and may not be cost-effective. Electronic prescribing may also have a role in preventing medication history errors. Electronic prescribing still depends on an accurate and complete medication history, but it will prevent some serious transcription errors (for example, prescribing methotrexate once a day rather than once a week). Electronic prescribing may alter prescribing behavior. As a whole, medication errors are reduced by electronic prescribing but they can also facilitate errors. Drop-down boxes in response to predictive text are a common feature of electronic prescribing systems and can lead to the selection of an unintended drug (e.g. amiodarone instead of amoxicillin). Similar drug names and differing proprietary names of long-acting formulations are as much a problem with electronic prescribing as with paper prescribing. Electronic prescribing reduces error, but does not remove the necessity of a through medication history. Furthermore, there is currently no standardized assessment of prescribing competence, for either undergraduates or postgraduates. Education of prescribers in basic and clinical pharmacology is key in preventing errors in the medication history and other medication errors. For example, when doctors were educated about the need to take a history of the use of complementary and alternative medicines and of previous adverse drug reactions, there were significant improvements in the recording of these details. In addition, the concept of harm from unintended medication errors needs to be emphasized to all prescribers. Without this, errors will continue to occur and patients will suffer harm (Roy, 2002).

Conclusion

Medication errors are common and can significantly harm patients. An important component is the medication history, which is often incomplete and inaccurate. Current studies suggest that this is a common and worldwide problem, but the results are limited by small numbers, differing measures, and poor assessment of consequences. Pharmacists can play an important role in preventing unintended errors, by being involved in obtaining medication histories during acute admissions or on post-take ward rounds. Electronic prescribing is not a substitute for an accurate medication history, although it may prevent some errors associated with transcription of medications. Finally, education of prescribers is vital to emphasize the importance of accurate medication histories and the clear potential for harm from unintended discrepancies. Medication errors are a public health issue. Within the facility of a health care system, a clear definition and guidelines for medication errors and adverse drug effects are needed. Nevertheless, medication error is common and is causing preventable human suffering and financial cost. Pharmacists should know our responsibilities and work hard to make medication use safe for our patients.[30,11,15,9,8,6]

'' AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE''

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