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An Approach to the Tools for Optimizing Medication Safety

Simranjeet Kaur[1*]

Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Punjab, India

***Corresponding author:** Simranjeet Kaur, Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Punjab, India; Tel. 916280177913; E-mail: simranjstl@gmail.com

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Abstract

Medication errors are the results of improper use of medications. Therefore, Medication safety is the utmost need of these days during the medication course. There are many strategies to be implemented for the improvement in medication safety, including reference update, patient condition understanding, recognition of high alert medications and many more. These strategies can be beneficial majorly for patients. Many methods including Medicines Optimization Assessment Tool (MOAT) are also available these days for ensuring improvement in the quality of medications.

Key words: Medication safety; Medicines Optimization; Medication safety tool; Adherences;Smart Pump; Drug events

Introduction

Medication safety: freedom from accidental injury during the course of medication use; activities to avoid, prevent, or correct adverse drug events which may result from the use of medications [1]. Medication error- These are the results of inappropriate use of medication use they can be prevented [2].

There are some strategies which can be implemented for improving the medication safety. These steps are for physicians and other health care providers to deal with the medications that are available to treat their patients **(Table 1).**

Methods to accomplish this

S.no.	Broad-Based Strategies Improving for Medication Safety
a)	Maintenance of up-to-date references and their availability during the drug is prescribed.
b)	Understanding the patient's conditions, diagnosis and indications for medication considered, also alternative therapies.
c)	Conditions should be taken care which can affect the efficacy of medication, like dosages, route of administration, patient weight, renal and hepatic functioning, and some special cases like Pregnancy.
d)	Special attention to be paid for potential interactions between a newly prescribed and on going medication, non-prescribed medications like supplements.
e)	Recognizing the risk of high-alert medications, it includes the discussion of those drugs which can cause remarkable harm if there is any kind of medication error.
f)	There should be compatibility between the patient's current medication and additional medication used when patient is admitted to the hospital.
g)	There should be reconciliation at the time of care transitions i.e. During the admission , discharge and subsequent follow up in ambulatory setting.

Table 1: Depicts Strategies for Improving Medication Safety

Guidelines for High- Alert Medications Management

Three principles can be used to avoid medication error **(Figure 1).**

Figure 1: several moments given by WHO for medication safety

Reduction in possibility of error

Removal of high-alert medication from clinical areas from clinical areas Reducing the no. of high alert medications stocked by hospital.

Highlight the errors

There should be double-checking for infusion pump settings for HAM to catch before it reaches to patient.

Reduce the consequences of error

Change in practices is needed so that adverse effects of error could reduce.

Proper monitoring to improve early detection of errors **(Table 2).**

S.No.	Categories of Medications
1.	Classes/ Categories of Medications
2.	Anesthetic agents (e.g. Ketamine, Desflurane, Propofol, Sevoflurane)
3.	Anticoagulants and Thrombolytic (e.g. Heparin, Warfarin)
4.	Chemotherapeutic agents (Parenteral / Oral)
5.	Concentrated Electrolytes (e.g. Potassium Chloride, Sodium Chloride)
6.	Hypoglycemic agents (Parenteral /Oral)
7.	Inotropes (e.g. Digoxin, Milrinone)
8.	Insulin
9.	Neuromuscular agents (e.g. Pancuronium, Atracurium, Rocuronium, Suxamethonium)
10.	Opiates
11.	Radio-contrast agents
12.	Sedatives (Parenteral / Oral)
13.	Vasopressors (e.g. Adrenaline)

Table 2: Shows the list of high alert medication

Guidelines for Concentrated Electrolytes Management

Following strategies must be considered

- Patient monitoring
- There should be monitoring of electrolyte level in patient before and after the replacement therapy
- e.g. E.C.G. monitoring
- Separate and label
- They should be separately placed on shelves.
- On shelves as well as on bins warning should be pasted for dilution of these products prior to administration [3].
- Prohibit the dispensing of vials

They should not be provided as ward/floor stock.

If vials are to be dispensed to critical areas they should be dispensed with bold auxiliary warnings also they need to be placed with proper care and in clean storage area (**Table 3**).

S.No.	Ingredients	Concentration (Volume)
1.	Calcium Chloride Injection	10% (10mL)
2.	Calcium Gluconate Injection	10% (10mL)
3.	Magnesium Sulphate 49.3% Injection	2 mmol/ mL
4.	Potassium Chloride 7.45% Injection	1 mmoL/ mL
5.	Potassium Dihydrogen Phosphate 13.6% Injection	1 mmoL/mL
6.	Sodium Chloride Infusion	Equal to or greater than (500 mL)
7.	Sodium Bicarbonate Injection	8.4% (250mL)
8.	Sodium Phosphate Injection	1 mmol/ mL

Table 3: represents the Standardized Concentrated Electrolytes Reference list

Optimizing tools

Medication Safety Toolkit

Medication Safety Tool- Introduction

Developed by Health Quality Innovators (HQI)

It provides medication safety and reduces adverse drug reaction.

It is a medication safety resource for patients, practitioners, and stakeholders

Beneficial for patients who are Taking multiple drugs or high risk medication as mention above. In high risk populations like- Behavioral health, Alzheimer's patients, Those facing disparities in care, such as low socioeconomic status [4].

Assuring Clinically Accurate Medication Orders

It ensures that the medication orders are clinically accurate.

Medication Management Checklist

Healthcare Provider Medication Checklist

Medication Therapy Management (MTM)

A program of drug therapy management designed to assure that covered part D drugs under the prescription drug plan are appropriately used to optimize therapeutic outcomes through improved medication use [5].

Comprehensive Medication Reviews

It is used by pharmacist to access the patient's current list of medication

Beer's Criteria

These are guidelines for healthcare professionals to help improve the safety of prescribing medications for older adults.

High-Risk Medications

Already discussed above in section 3.1

Medication Reconciliation

It is the collaboration of the health care professionals to improve the patient safety and clinical outcomes which are related to medication.

Access and Adherence to Medication Plans

Measuring Adherence

It consists of three question asked by pharmacist to patient on answering those questions pharmacist came to know about the patient's concern about taking that medication [6].

Earlier Morisky Scale was used.

Now a days, Medication Adherence Rating Scale (MARS) is used.

Improving Adherence

Communicate with your health care professional

Make sure you understand how long to take the medication

Tell your doctor if paying for prescription drugs is a problem

Set daily routines to take medication

Keep medications where you'll notice them

Use daily dosing containers

Keep a written or computerized schedule

Measuring, Reducing and Reporting Adverse Events

Systems Approach to Measuring Adverse Drug Events

Measuring Adverse Drug Events

The Institute of Safe Medication Practices (ISMP) provides a list of Alert Medications in various healthcare settings:

ISMP – Acute

ISMP – Ambulatory Care

ISMP – LTC

Reducing Adverse Drug Events

Computerized prescriber order entry medication safety (cpoems)

According to changing scenario we are blessed with the system of computerized prescription or it is called e-prescription. As it is advantageous it has some demerits like errors also. To analyze this error US FDA has given a center i.e. Brigham and Women's Hospital (BWH) Center to do research.

N and C medications

These are narcotics and controlled medications which needs special safety. Therefore, advanced technology is used i.e. Pyxis. Before Pyxis the process of analysis takes place in 41 min. After implementing Pyxis. The process is completed in 10-15 mint. Importance of assessing Narcotics and controlled substances are Safety

Quality of care

Continuous improvement

Resource optimization

Financial optimization

Improved employee satisfaction

Patient Education

This is just a program for patient organized by the pharmacist to teach the patient about why they have to medication, how to take medication, what medication they have to take and at last duration of therapy [7].

The pharmacist also have to inform about some important instructions.

Barriers to Safe Medication Use

Health literacy

Cost/access to care

Cultural differences

Medicines Optimization Assessment Tool (MOAT)

Medicines Optimization - It is majorly for pharmacist and some reviews resulted that adding up the clinical pharmacy services to the hospital inpatients improve the quality, safety and efficiency of care [8]. To identify adult patients at highest risk of preventable, moderate or severe MRPs during admission to assess the MOAT's content validity, feasibility of use, potential efficiency savings and the potential clinical risk associated with false-negative predictions.

To permit appropriate targeting of patients by pharmacy staff in order to reduce risks, improve patient outcomes and increase efficiency of hospital clinical pharmacy services

Supports the delivery of national targets related to patient safety, medicines optimization and service provision.

Methods and Analysis

Select candidate predictors

Combine them into a multivariable model using logistic regression

Internal validation will be used to evaluate the performance of the model and permit adjustment for optimism

It involves adults admitted to the medical wards of two hospitals- Hospital A and B

Eligibility criteria

Age- 18 or above

Wards- general, emergency and elderly medicine

Other specialties- surgery, maternity and paediatrics will be excluded due to potential differences in the prevalence/type of MRPs (medical related problems) in these patient groups

Outcome

Identification and recording by pharmacist at study sites as part of their routine which is known as daily clinical assessment of patients

They have to record data on all MRPs identified either by them or collected on discussion with other health care professionals

Hospital incident reporting system is also reviewed to check additional significant MRPs that are not identified by pharmacy staff.

Training on the use of Basger's aggregated classification system **(Table 4).**

S.no.	Demographic	Details/ categories	Type of measurement	Number variables
1.	Age	Age at admission to hospital (in years)	Continuous numeric	1
2.	Socioeconomic stat	Based on the English indices of deprivation 201	Continuous numeric	1

Table 4: Demographics and details

Medication management program

A program started by Ohio state university college of pharmacy. It was implemented across US. This program utilizes SinfoniaRx. named software. This program helps patients to take care of their health through data analysis [9].

WHO International Conceptual Patient Safety (ICPS) framework

Its main aim is to represent a continuous learning and improvement cycle which works on identification of risk, prevention, detection, reduction of risk- all of these can occur at any point The 10 high-level classes are: [10].

1. Incident type
2. Patient outcomes
3. Patient characteristics
4. Incident characteristics
5. Contributing factors
6. Organizational outcomes
7. Detection
8. Mitigating factors
9. Ameliorating actions
10. Actions taken to reduce risk.

It contain 48 key concepts

MedRec

It is a process initiated by Canada in 2011. In this several entities work together like patients, caregivers and families of patients. This program is to ensure that during care transition the medication communication is consistent.

Smart pumps

These pumps allow clinicians to pre-program standard concentrations and analyze upper and lower dose limits for different drugs specially ones which has some hazardous effects. These pumps work in such a way that they warn healthcare provider if the dose is too high, and record what happens if the dose is overridden.

Mobile applications for optimization medication safety

a) bant2- It can be used by android as well as iPhone users. It analyze daily food intake, weight and blood glucose.

b) Noom Health- It gives users about their disease.

c) DialBetics- It is for Japanese speaking users. It teaches users about healthy habits they should adopt in their lifestyle

Tools for Optimizing Medication Safety (TOP-MEDS)

It keeps eye on following issues by developing, testing, deploying, and disseminating tools and training materials in these areas:

1) Statistical methods for large-scale studies of comparative drug safety and effectiveness

2) Opioid prescribing and dosing for acute pain

3) Methods for preventing and detecting drug name confusion errors

4) Patient centered, language-concordant drug information.

There are so many recent cases that we have seen in our societies undergoing which are called as adverse drug reactions or adverse drug events. These events are sometimes less harmful but in some cases they may leads to death of patient. Also there is a list of high risk medications and patients who are administering those drugs are more prone to ADRs. Also the drugs which are to be administered through I.V. route have more chances to cause ADRs.

Discussion

There are several guidelines launched for safe medication therapy. The tool kit for the same is also introduced. This kit takes in account the patient history, current medication, therapy management, adverse effects and administration of high risk medication. There are some methods to check ADRS and analyses the extent of ADRs. Medicines Optimization

Assessment Tool (MOAT) is for pharmacist to improve the quality of medication. Safe medication management practices are continuously on improvement path so that adverse events caused by them could get reduced.

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