Medication Management System: An Approach to Reduce Medication Error In Apollo Hospitals Dhaka

A Mahmud[1], F Noor[2], M Nasrullah[3]

Abstract

Apollo Hospitals Dhaka surely stepped ahead than any other hospital of Bangladesh for reducing medication errors significantly. From the very beginning of its establishment, reducing medication errors was taken as a major challenge and effective and approved strategies were developed when no other hospital took efforts in this regard. Strategies included tracking incidents of medication errors, analyzing, reporting & arranging proper training sessions for hospital staffs etc.

All four types of errors like Prescription errors, Transcription errors, Dispensing errors and Administration errors are rectified and officially reported by hospital pharmacists. Along with these, Prescription Reviewing, Medication Reconciliation, incidents of Adverse Drug Reactions (ADR) are also monitored to ensure rational drug use for patients. With all its efforts, Apollo Hospitals Dhaka was able to reduce the rate of medication errors within the internationally acceptable range.

Key Words
Apollo Hospitals Dhaka, prescription errors, transcription errors, dispensing errors, administration errors, prescription reviewing, ADR monitoring, reducing rate of medication errors.

Introduction
Medication error has been quite a severe problem in Bangladesh for a long time but very few serious measures have yet been adopted to overcome or reduce this. However, Apollo Hospitals Dhaka has come forward and put in an impeccable effort to eradicate this ongoing issue. This Hospital has successfully brought down the rate of medication errors to 2.45 per cent which is indeed a remarkable achievement. It was able to accomplish this task by adopting certain strategies and simultaneously keeping a balanced focus on the service/ treatment available to the patients.

Facts and Figures
The operation was started with the target of reaching three medication errors per 100 discharges within three months. The US benchmark is 5:100 and Apollo Hospitals has exceeded this US standard with the current rate being 2.45:100. The medication errors were reviewed and the trend showed a further decline of medication errors at the end of four months.

Plan, Do, Check, Act
The first step before getting all the forces into action was DMAIC (Define, Measure, Analyze, Improve and Control) & Fish Bone Analysis. Through DMAIC and Fish Bone Analysis, the reasons for medication errors were analyzed thoroughly (Fig.1).
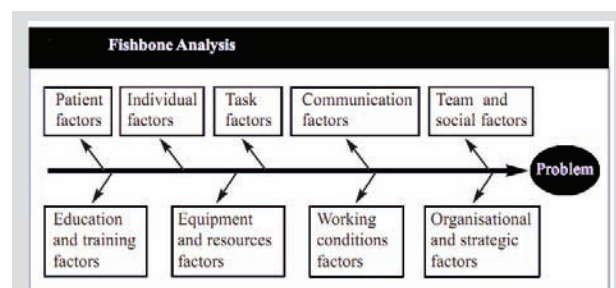

Figure 1: Fish Bone Analysis to Sort out Roots of Problems[11]

1. General Manager, MS Department, Apollo Hospitals Dhaka 2. Sr. Manager, MS Department, Apollo Hospitals Dhaka 3. Sr. Manager, Pharmacy Department, Apollo Hospitals Dhaka

In order to track down medication errors and responsible causes, several sets of strategies were adopted by Apollo Hospitals (Fig.2). The mechanism of tracking, reporting and analyzing the trends of the medication errors were discussed & approved in the Drug Committee meeting. the trends of the medication errors were discussed & approved in the Drug Committee meeting.
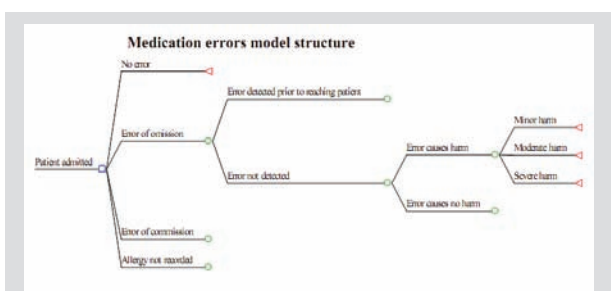

Figure 2: Medication Errors Model Structure.[12]

The next step was to re-design the entire medication system. After identifying the loopholes, medication management system was re-designed, right from prescribing, indenting, documenting and administering, storing, handling, labeling to reporting.[2]

Figure 3: Designing a Medication System with Best Outcomes.[13]

The staffs were educated on the significance of medication errors and training sessions were conducted. The Hospital adopted a multi-pronged strategy with the aid of technology to reduce the error rate effectively (Fig.3).
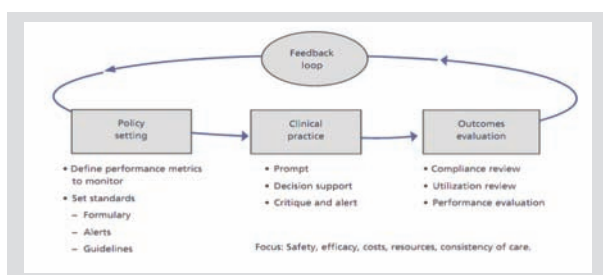
Prescription Review by Pharmacist

Bringing information on patterns of existing practice together with information on appropriate practice is an essential component of efforts to improve healthcare. This is possible only when each and every prescription in the hospital is reviewed by a prescription review team (Pharmacist).

The process of prescription reviewing in its broad sense include prescription monitoring, drug utilization studies, prescription pattern studies, study of prescription habits of doctors, adverse drug reaction monitoring, drug interaction monitoring, dose individualization, criteria based prescription reviewing and many other activities.[2] The prescription order is reviewed for

- Appropriateness of the medication ordered
- Appropriateness of the dosage form ordered
- Appropriateness of dose ordered
- Appropriateness of the frequency ordered
- Appropriateness of the route ordered
- Screening for possible duplication of therapy
- Screening for possible interactions with other
- medications
- Screening for possible Drug-Food Interactions
- Screening for possible allergies or sensitivities
- Screening for other contraindications.
- Variation from organizational criteria for use.
- Patients' weight and other physiological
- information; and
- Other contraindications

Adverse Drug Reaction (ADR) reporting could also be confirmed by a search for prescriptions containing tracer drugs e.g. Pheniramine maleate injection.[3]

Methods of prescription reviewing

The method used for prescription reviewing depends upon purpose for which it is carried out. A routine review of prescriptions is carried out focusing on certain specific group of drugs namely- antibiotics, anti-cancer drugs, anti-

hypertensive drugs, analgesics (NSAIDS and opioids), anti-ulcer drugs, geriatric medicines for the purpose of doing a drug utilization study, prescription pattern studies, rational drug use studies and various other types of studies.

These studies are very helpful in collecting data regarding prescription habits of doctors, comparison of efficacies of different drugs, adverse effects associated with a drug or with a particular brand name.

A developed hospital method involves conducting routine screening of all the prescription drugs[4], indented by the nursing staff or pharmacists to the pharmacy, along with the prescribed information regarding the drug name, strength, formulation, doses, and route of administration, frequency and duration of treatment (Fig 4).[5]
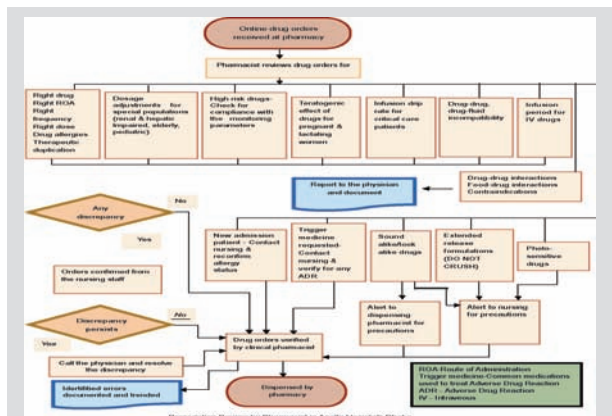
Process Flow Chart for Prescription Review:

Figure 4: Process Flow of screening all Prescribed Drugs in Hospital

Standard Operative Procedure

1. Doctor prescribes medicines on drug order sheet. (Fig 5)
2. Indents made by the Ward Pharmacist / nursing staff (drug order transcribed to pharmacy through an online module).
3. The indents contain – drug name, strength/dose, formulation, route of administration, frequency & duration of treatment.
4. Indents checked by the pharmacists (using

software). Pharmacists should read it carefully and check the drug name (generic/brand), strength/dose, formulation, route of administration, frequency and duration of intake. (Fig-5)

5. Pharmacists specifically screens indents for Restricted Antibiotics, High Alert Medications made from the ICUs & wards since these patients are more prone to require dose adjustments, drug interactions and adverse effects (cases of altered pharmacokinetics and pharmacodynamics).[6]
    Note: In case any correction / suggestions / recommendation/ need for an alternate therapy is felt by the pharmacist, a verification call is given to the doctor (prescriber).

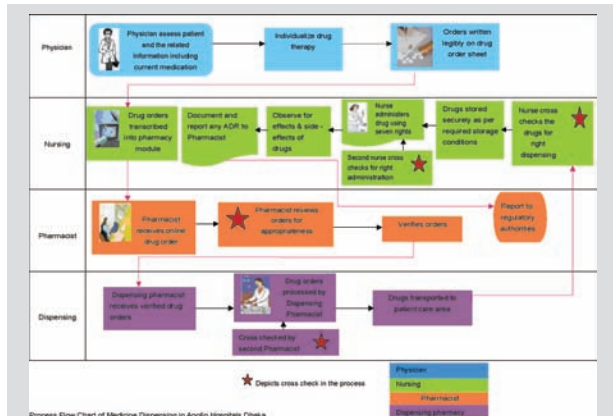**Process Flow Chart of Medicine Dispensing in Apollo Hospitals Dhaka**

Figure 5: Process Flow Chart from Prescribing to Dispensing of medicines in Apollo Hospitals Dhaka. Outcomes of Prescription Reviewing

Outcomes of Prescription Reviewing

Medication Errors

The sources of medication errors reported by prescription review team could be from the mistakes of doctors, nurses or pharmacists. Medication errors are basically of two types: intercepted errors and actual errors, on the basis whether they reach the patient or not.[7]

Both the types of errors are further divided into four categories-

•   Prescription error
•   Transcription error
•   Dispensing errors
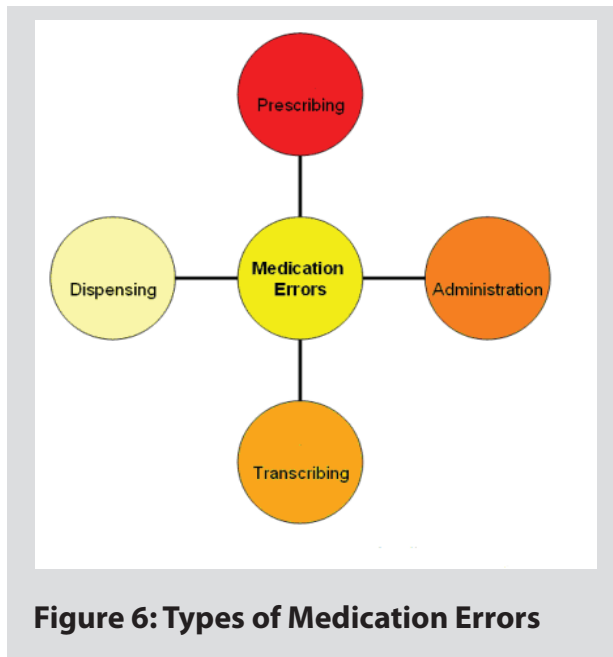•   Administration error

Figure 6: Types of Medication Errors

Except for administration errors, all other types of errors could be rectified by prescription reviewing. The administration error could only be rectified by ward pharmacists while checking patients' medicine box. Prescription errors which are corrected and prevented by prescription review team are called as intercepted error.[8]

Type of Error and Criteria

Prescription Errors
1. No route specified
2. Drug prescribed as-needed order without an indication.
3. Drug is indicated but the dose is inappropriate
4. Drugs prescribed as-needed order without a time interval.
5. Order of changing dose without discontinuation of previous order.

6. Order is illegible.
7. Order is incomplete in specifying dose or frequency.

Transcription Errors
1. Order is not transcribed at all.
2. Order is transcribed incorrectly.
3. Allergy is not documented on the medication administration record.
4. Allergy is not documented on the order sheet.

Administration Errors
1. Scheduled dose is not documented as administered
2. Drug is administered without a physician order
3. Dose missed because of late transcription
4. Order is incorrectly entered in the pharmacy computer
5. Wrong Route
6. Wrong Strength

Dispensing Errors
1. Wrong drug or strength dispensed
2. Wrong preparation dispensed

Near Miss and Medication Error Index
This is required for categorizing medication errors & near miss. Medication errors which has a potential to cause injury or harm and that was detected and corrected before it reaches the patient. It is a process variation with a potential to cause serious adverse outcome if recurrent.

Near Miss Category: Near miss has following 2 categories but when it reaches to the patient it is a medication error.

Category A: Circumstances or events that have the capacity to cause error- near miss of medication error

Category B: error occurred but didn't reach the

patient- near miss of medication error.

Medication Error Category

Category C: An error occurred that reached the patient but did not cause patient harm.

Category D: An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm.

Category E: An error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention.

Category F: An error occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization.

Category G: An error occurred that may have contributed to or resulted in permanent patient harm.

Category H: An error occurred that required intervention necessary to sustain life.

Category I: An error occurred that may have contributed to or resulted in the patient death.

ADR Monitoring

The adverse drug reaction is monitored by the tracer drugs like Pheniramine maleate injection and by checking indications for which they were prescribed, during hospital rounds. If any adverse drug reaction occurs it is reported on an ADR reporting form. All details regarding the suspected drug e.g. brand and generic name, doses, route of administration should be documented.[9] The ADR should be described according to the signs and categorized according to the severity.

The type of reaction should also be noted down on the basis of Severity Scale:

- Level 1 - ADR occurred, but requires no change in treatment with suspected drug.
- Level 2 - Drug held, discontinued or changed, but no antidote or additional treat ment needed.
- Level 3 - Drug held, discontinued orchanged, AND/OR antidote or treatment required.
- Level 4 - ADR requires patient transfer to an Intensive Care setting.
- Level 5 - ADR causes permanent harm to the patient.
- Level 6 - ADR, either directly or indirectly leading to the patient's death.

Probability of the Adverse Drug Reaction is analyzed by Naranjo Scale.[14] Naranjo scores of 9 or 10 indicate that an event was "definitely" an ADR; scores of 5-8 rate the likelihood as "probable"; scores of 1-4 are "possible"; and scores of less than 1 are "doubtful."

Introduction of Ward Pharmacist to reduce Medication Errors

A dedicated ward pharmacist is allocated to each unit. Ward pharmacists are assigned to give regular indent of medicine for all patients in their units after screening prescriptions. While screening prescriptions they can detect whether there is any anomaly in the prescription, for example, is there any medicine in the prescription that requires dose adjustment, is there any possibility of interaction between the drugs prescribed, is the dose properly calculated for pediatric patients etc. Whenever there is any confusion, they communicate with doctors and ensure that patient gets safe medications.

They give input of the patient's information such as allergy information, vital signs (Patient Weight & Height), medicine reconciliation in the system. They also communicate about

patient related issues with the prescription review team which smoothen the whole medical service. Furthermore, patients weight, height, age, gender is required for calculation of creatinine clearance and body surface area, dose assessment etc. Before, nurses had to request for medicine to Pharmacy and sometimes due to their lack of knowledge in medicine or for other reasons, mistakes occurred. The percentage of medication errors is declining gradually since ward pharmacists were introduced. They are together maintaining a connection between pharmacists and all other healthcare providers for the betterment of patients.

Medicine Reconciliation & list of current medication available in Pharmacy

Ward Pharmacist gives input of the current medicines list from medication chart in the HMS (Hospital Management System) so that list should be made available in Pharmacy; So that initial medication order is compared with the list of medication taken prior to admission. This is done to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions. This also enables the Pharmacy to check previous medication of the patient. This is very essential while checking patient's medical history.[10] If a patient develops adverse drug reaction during his/her stay in the hospital, pharmacists can easily do the probability of ADR through Naranjo Scale and justify whether this is because of recently prescribed drugs or of patient's previous medication.

Discussion of Medication Errors in Drug Committee Meetings

All the stakeholders meet regularly to discuss and review trends and rates of medication errors with doctors and nurses and corrective measures are decided in the committee meeting.
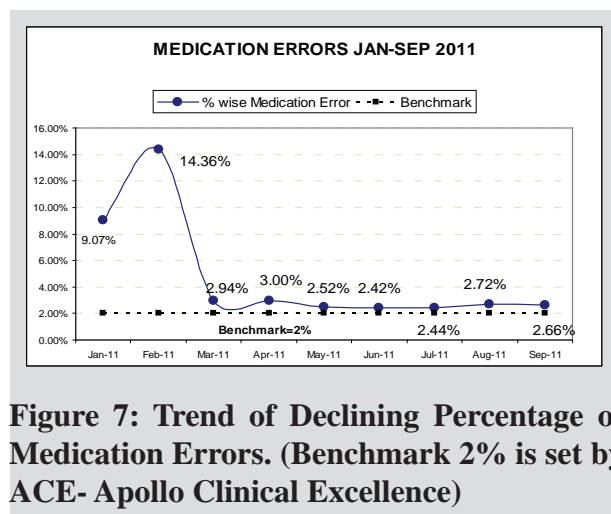

Figure 7: Trend of Declining Percentage of Medication Errors. (Benchmark 2% is set by ACE- Apollo Clinical Excellence)

Challenges in the pathway

The first challenge was unwillingness in reporting of errors by nurses and doctors which meant that accurate reports were not presented. Thus lack of authenticity was a challenge while carrying out the operation of reducing medication errors.

In the healthcare industry of Bangladesh, medication error has not been the subject of serious examination and no leading hospital is known to be systematically collecting statistics of its medication errors. Hence, this initiative of Apollo Hospitals Dhaka is unique as it sets an example for other hospitals for identifying, reporting, and reducing medication errors. The operation focused on minimizing the chances of medication errors by introduction of repeat checks at each node. There is no initiative as such that is involved in the process of determining medication errors, the only pre-requisite being usage of computerized systems in hospitals and optimum utilization of available resources.

Conclusion

The process of prescription reviewing is a type

of vigilance activity, which is very beneficial for the hospital in terms of reducing the burden because of medication errors and increasing the rate of patient recovery and reducing the length of stay in the hospital. Since a zero medication error is quite an impossible target to achieve, the only way to reduce medication errors is by a thorough scrutiny of all the steps involved in medication process and prescription reviewing is done at a very important step, ie before the medications are dispensed. This should be implemented in all the hospitals in Bangladesh, where the patient load is too high to be handled properly.

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