# Failure Mode Effect Analysis of Medication Management Process

**Internship Training**
**at**
**Medanta-The Medicity, Gurgaon**

**By**
**Khushboo Jain**

**Under the guidance of**
**Dr. Anoop Khanna**

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**INSTITUTE OF HEALTH MANAGEMENT RESEARCH**
1, Prabhu Dayal Marg
Sanganer Airport, JAIPUR - 302 011, INDIA
Tel. : 3924700, 2791431-32
Fax : 91-141-3924738
E-mail : iihmr@iihmr.org
URL : http://www.iihmr.org
Gram : HEALTHINST

## TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Khushboo Jain**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from Institute of Health Management Research, Jaipur has undergone internship training at Medanta, The Medicity Hospital, Gurgaon from 01 Feb. 2014 to 04 May 2014.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.
The Internship is in fulfillment of the course requirements.
I wish her success in all her future endeavors.

Dr. Ashok Kaushik
Dean, Academics and Student Affairs
IIHMR, Jaipur

Prof. Anoop Khanna
Associate Dean, Research
IIHMR, Jaipur

Global Health
Private Ltd.

Date : 03rd May 2014

***TO WHOMSOEVER IT MAY CONCERN***

***This is to certify that Dr. Khushboo Jain has successfully completed her dissertation from 01 Feb 2014 to 04 May 2014 on the topic Failure Mode Effect Analysis of Medication Management Process in the department of Medical Administration with Global Health Private Limited (GHPL), Medanta- the Medicity Hospital, Gurgaon (Haryana)***

***Very truly yours,***
***For Global Health Private Limited***

***Authorized Signatory***

**Regd. Office:** E-18, Defence Colony, New Delhi 110 024, Ph.: +91 11 4411 4411 Fax: +91 11 2433 1433

**ACKNOWLEDGEMENT**

*A journey is easier when you travel together. Interdependence is certainly more valuable than independence. This project report is the result of three months of training whereby I have been accompanied and supported by many people. It is a pleasant aspect that I now have the opportunity to express my gratitude for all of them.*

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| MMP | Medication management process |
| M.O | Medical officer |
| J.R. | Junior resident |
| MAR | Medication administration record |
| HIS | Hospital information system |
| IPD | Inpatient department |
| NCCMERP | National coordinating council for medication error reporting and prevention |

## LIST OF TABLES AND GRAPHS

# PART B

# DISSERTATION

**PROBLEM STATEMENT**:

Medication management is one of the most complex parts of a hospital's healthcare delivery system which includes processes such as prescribing, transcribing, administering, dispensing and monitoring of effects for various drugs. Drug use is a complex process and there are many drug related challenges at various levels. Improving patient safety by reducing medication errors is the top priority of the hospitals as improper usage of drugs can lead to life threatening consequences including death affecting not only the patient but also healthcare in general. Errors can occur at any stage of the medication process hence rather than upholding a punitive approach, the focus should be on "prevention" and devising the strategies which can minimise errors and adverse medication results.

FMEA is the systematic analysis of a process to identify the possible ways it might fail (i.e. failure modes), the effects or results of failures and the possible causes of failures. The goal of FMEA is to predict how and where systems designed to detect errors fail and how processes can be improved to reduce the potential for failure.

**RESEARCH QUESTION**: How to improve patient safety with the help of FMEA of medication management process in the hospital?

**AIM**: To assess various risk points existing in the medication management process of the hospital and analyse the causes and effect of those failure modes with the help of Failure mode effect analysis (FMEA) tool.

**OBJECTIVES**:

- To review the medication management process that is the process mapping.
- To identify the possible failure modes in the process along with their severity and frequency.

- To analyse the causes and effects of various failure modes.
- To propose recommendations to eliminate the failures in the process so as to minimize medication errors.

**REVIEW OF LITERATURE**:

The use of medications is an integral part of medical care in hospitals (1,2). Medication management is usually a multidisciplinary and coordinated effort of staff applying the principles of effective process design, implementation, and improvement to the selecting, procuring, storing, ordering/prescribing, transcribing, distributing, preparing, dispensing, administering, documenting, and monitoring of medication usage (2). The prescribing of a medicine by the consultant sets in motion a complex series of interrelated supply chain and workflow processes aimed at providing the patient this medication as quickly, efficiently, accurately and cost-effectively as possible. A breakdown at any point in these processes may lead to delayed, omitted or incorrect medication therapy (3). Medication-related problems frequently occur during transitions and lead to patient harm, increased use of healthcare resources and increased costs (4).

As defined by the National Coordinating Council for medication error reporting and prevention (**NCCMERP)**, **a medication error is "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer.** Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labelling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use" (5). Medication errors compromise patient confidence in the

health-care system and increase health-care costs. The problems and sources of medication errors are multidisciplinary and multi-factorial. Errors occur from lack of knowledge, substandard performance and mental lapses, or defects or failures in systems. Medication errors include prescribing errors, dispensing errors, medication administration errors, and patient compliance errors. Many medication errors are probably undetected. The outcome(s) or clinical significance of many medication errors may be minimal, with few or no consequences that adversely affect a patient. Tragically, however, some medication errors result in serious patient morbidity or mortality. Thus, organizational policies and procedures should be established to prevent medication errors. Development of the policies and procedures should involve multiple departments, including pharmacy, medicine, nursing, risk management, legal counsel, and organizational administration (6).

FMEA is an effective proactive risk-assessment tool useful to aid multidisciplinary groups in understanding a process care and identifying errors that may occur, prioritising remedial interventions and possibly enhancing the safety of drug delivery. It is based on the concept that a risk is related not only to the likelihood of a failure occurring, but also to the severity of the failure's consequences and the feasibility of detecting and intercepting a failure before it occurs (7). Patients have a right to receive and hospitals have an obligation to provide, the right medication, for the right reason, at the right time (3).

**METHODOLOGY:**

Type of study: Observational analytical study

Location of study: In-patient department, Medanta-The Medicity hospital, Gurgaon

Study subjects: In-patient records studied for 2 months.

Sampling technique: Convenient sampling, a sample of 300 inpatient records were studied across a period of 2 months.

Sources of data collection: through study of In-patient records and direct observation.

Data collection tool: Failure mode effect analysis (FMEA) tool. The study was conducted in four phases involving process mapping, identifying failure modes, prioritising of failure modes according to severity and frequency followed by recommendations to minimize or eliminate the failures.

**Design and study population**

The study was designed as an observational analytical study of medication management process and the involved failure modes were examined by the use of two methods—direct observation and inpatient records. The study population consisted of: (i) hospital inpatients (ii) nurses dispensing and administering medications; (iii) physicians prescribing drugs or medical officers/Junior residents transcribing drugs into the medication administration record.

The study included regular as well as stat medications. The following forms of drugs were included: tablets, suppositories, mixtures, and injections (intravenous, intramuscular, and subcutaneous). Admitted patients having certain current medications were included to check the status of these medications (whether the current medications to be continued in the hospital or not).

**Settings**

The study was conducted on a multi-speciality floor, from 15$^{th}$ February to 20$^{th}$ April 2014.

Physicians are responsible for prescribing drugs and medical officers/junior residents for transcribing them into medication administration records (MAR). Nurses transcribed

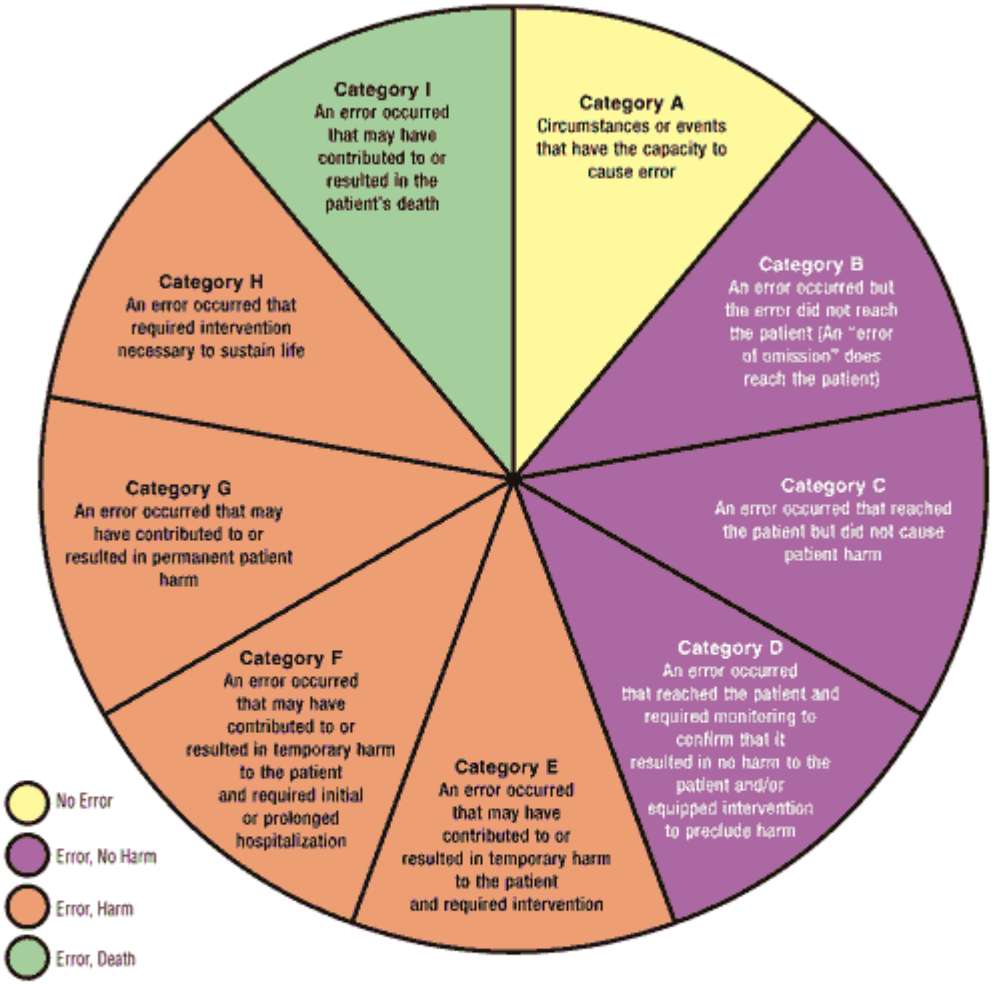
drug prescriptions from the medication administration records into a medication indent register and were responsible for verifying, dispensing and administering medication. The assigned medication nurse indents the medication in the Hospital information system (HIS) which is then accepted and dispensed by the inpatient pharmacy.

**MEDICATION ERRORS:**

As defined by the National Coordinating Council for medication error reporting and prevention (NCCMERP), a medication error is “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labelling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use" (5).

Medication errors can be defined as any occurrence that can cause a patient to receive the wrong drug, wrong dose, through wrong route and wrong frequency.

## Figure 1. NCC MERP Index for Categorizing Medication Errors




### DEFINITIONS

**Harm**
Impairment of the physical, emotional, or psychological function or structure of the body and/or pain resulting therefrom.

**Monitoring**
To observe or record relevant physiological or psychological signs.

**Intervention**
May include change in therapy or active medical/surgical treatment.

**Intervention Necessary to Sustain Life**
Includes cardiovascular and respiratory support (eg, CPR, defibrillation, intubation, etc).

**Types of Medication Errors:**

1. **Prescription Errors**: the errors which originate from written medication orders. It includes the following:

- Wrong drug prescribed
- Route not specified
- Inappropriate dose
- Order changed without discontinuation of previous order
- Illegible order/overwriting
- Incomplete order in terms of not specifying the dose or frequency
- Use of abbreviations not mentioned in the approved list

2. **Transcribing Errors**: the errors which originate during transcription of original physician order into medication administration record (MAR) by the medical officer/junior resident. It includes the following:

- Order not transcribed at all
- Order transcribed incorrectly
- Allergy not documented
- Medicine stop date and sign not mentioned
- The current medications are not mentioned/ 'to be continued or not' in the MAR.

3. **Administration Errors:** an error originating during the process directly associated with the medication administration by the nurse. It includes the following:

- Scheduled dose not documented as administered
- Drug administered without a physician order
- Dose missed but documented

- Wrong drug/dose/form administered

4. **Dispensing Error**: an error originating when medication is dispensed from pharmacy. It includes the following:

- Wrong order placed in the HIS from the inpatient department (IPD)- **Indenting error**
- Wrong drug dispensed by the pharmacy
- Wrong form/ dose dispensed

5. **Monitoring Error**: an error originating from:

- Lack of necessary monitoring or interpretation/appropriate action for selected drugs (ex. Drug level monitoring for certain antibiotics, anticoagulants, anticonvulsants, etc. not done like high risk drug form and antibiotic stewardship form not filled).
- Verification not done properly by the assigned medication nurse at the time of administration.

The intercepted errors or near misses (the error which has not reached the patient) are documented by the preceptor (assigned nurse who identifies the training needs of the nurses and incorporate in their teaching plan) in the form of checklist and randomly checked and corrected by the clinical pharmacist while taking IPD rounds. The actual errors or an 'error of omission', which does reach the patient in spite of verification, are reported on a proper format called as 'medication error reporting form'. They are also reported by the monthly audit of discharge files.

According to hospital policy, following is the **protocol for medication error reporting**:

- The head nurse checks every medication chart for any error on daily basis.
- The near miss events related to medications are reported as well.
- The medication error has to be reported immediately to the senior nurses and the report is submitted in the nursing office and to clinical pharmacist within 24hours.

The hospital's **criteria for medication error and near miss** are:

- Medication given to the wrong patient
- Wrong medication administered
- Wrong dose administered
- Wrong route of medication used
- Medication not given at the right time
- Medication not given
- MAR not accurately documented
- Newly prescribed order not initiated properly
- Medication refill not ordered timely
- Wrong dose written by physician
- Wrong medicine dispensed by pharmacist
- Wrong medicines indented by nurse

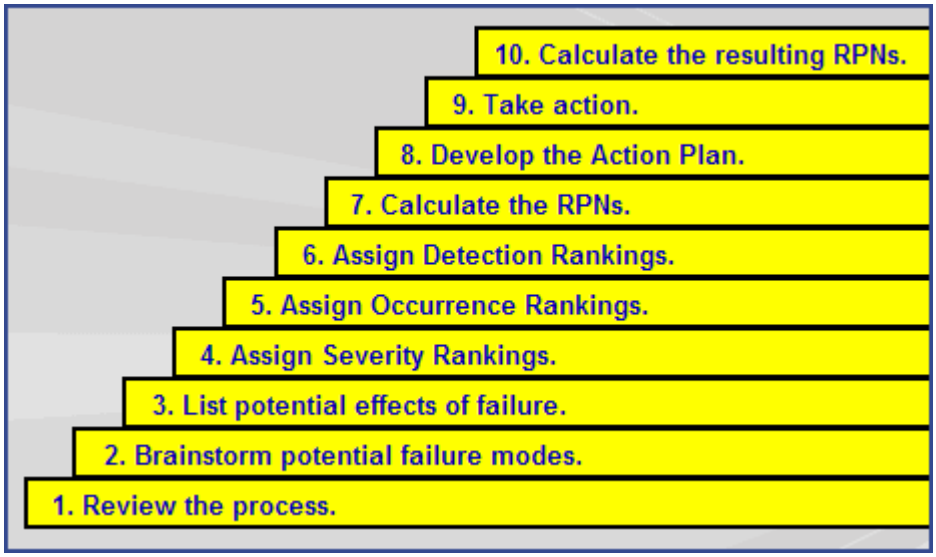
There are many factors that are associated with drug errors including inadequate knowledge and skills, failure to comply with policies, and failure in communication. The safest work environments address these issues by designing systems to prevent errors, make errors visible and mitigate the effects of errors.

**TOOL USED**: Failure mode and effect analysis (FMEA)

According to **Institute of Healthcare Improvement**, Massachusetts, Failure Modes and Effects Analysis (FMEA) is a systematic, proactive method for evaluating a process to identify where and how it might fail and to assess the relative impact of different failures, in order to identify the parts of the process that are most in need of change. FMEA includes review of the following:

- Steps in the process
- Failure modes (What could go wrong?)
- Failure causes (Why would the failure happen?)
- Failure effects (What would be the consequences of each failure?) (8).

FMEA is used to evaluate processes for possible failures and to prevent them by correcting the processes proactively rather than reacting to adverse events after failures have occurred. This emphasis on prevention may reduce risk of harm to both patients and staff. FMEA is particularly useful in evaluating a new process prior to implementation and in assessing the impact of a proposed change to an existing process. There are 10 basic steps to the FMEA process.



The steps for conducting FMEA are as follows:

**Step 1: Review the process**. The first step in FMEA is to review the steps in the medication management process (MMP) namely prescription, transcription, ordering, dispensing, administration and monitoring.

**Step 2: Brainstorm**. The second step would be to brainstorm the potential failures. This involves determining each step in the medication management process that can fail and identifying how it can fail. For example: The ordering of a medication could fail for several reasons, including if the order contains illegible writing or the order includes a confusing abbreviation or an abbreviation that is not on the organisation's approved list of abbreviations.

**Step 3: list potential effects**. The third step is to list potential effects of each failure mode. For example: Both an illegible handwritten order and an incomplete order could result in the wrong medication, dose, frequency or route being administered. The effect of each possible failure should be determined for each of the steps in the MMP.

**Step 4: Assign a severity rating**. The fourth step is to assign a severity rating for each potential effect. This step determines how serious the impact will be if a failure occurs. The severity scale used can range from a slight annoyance within the system, which may rank as a 1, to terminal injury or death, which would rank as a 10. In between would be scores for moderate and major system problems as well as minor and major failures. For example: An allergic drug reaction manifested as hives would be considered a minor injury, whereas acute renal failure would be considered a major injury. This step helps in determining the 'criticality' of the failure modes, which is a means of prioritizing the failure modes to determine which ones are most important to analyze further and to address, through redesign of the process.

**Step 5: Assign a frequency rating**. The fifth step is to assign a frequency/occurrence rating for each failure mode. The frequency/occurrence scale should address the likelihood and probability of the failure mode's occurrence. The likelihood should range from remote, with a score of 1 in 10. When a failure mode is remote, there is no known occurrence. An instance of a remote failure mode is when the vial of a medication from a pharmaceutical manufacturer contains a different drug than what the label says. When a failure mode is very high, it is documented and almost certain. Illegible handwriting has a high likelihood of occurring; therefore, it would have a score of 10. In between scale points may be low, moderate or high.

**Step 6: Assign a detection rating**. The sixth step is to assign a detection rating for each failure mode. The detection scale rates the likelihood of the failure being detected, from very high with a score of 1, to remote with a score of 10.

**Step 7: calculate the risk priority**. The seventh step is to calculate the RPN for each effect. RPN= S*F*D (this involves multiplying the severity rating by the frequency rating by the detection rating).

**Step 8: prioritize the failure modes**. The eighth step is to prioritize the failure modes based on the RPN for each action. Prioritizing the RPNs enables us to concentrate on those issues that appear to have the greatest risk.

**Step 9: eliminate/reduce the failure modes**. The ninth step is to take action to either eliminate or reduce the high risk failure modes or protect patients from their effects. This includes conducting a root cause analysis (RCA) of the top failure modes. The following are the goals of this step:

- Decrease the likelihood of occurrence
- Decrease the severity of effects
- Increase the probability of detection

**Step 1.**

**PROCESS FLOW**

The doctor/consultant prescribes medicines in the progress notes

↓

The junior resident/medical officer in IPD transcribes in the Medication administration record, including the current medications to be continued in the hospital

↓

The staff nurse copies the medicines in the medicine indent register

↓

The medication nurse indents the medicines in HIS

↓

Registration of the indent by the IP pharmacy in HIS

↓

Dispensing and dispatch of drugs from the pharmacy

↓

Receive of drugs in the respective IPD area by the medication nurse

↓

Administration of drugs by the respective staff nurse after verification by the medication nurse

**Step 2.** Identification of failure modes**:**

**Failure modes**: the following failure modes were identified after reviewing the medication management process:

i. FM 1- incomplete prescription in terms of dose/ route/ frequency
ii. FM 2- allergies of the patient are not known/ not mentioned
iii. FM 3- the medicine is transcribed wrongly in the MAR.
iv. FM 4- the medicine is copied wrongly in the medicine indent register.
v. FM 5- medicine not indented properly in HIS
vi. FM 6- wrong medicine/dose/form is dispensed by the pharmacy
vii. FM 7- medicines are not cross checked against the order as indented.
viii. FM 8- administration time not properly listed in the MAR.
ix. FM 9- the new/changed medicines are not added after the consultants round and the stopped drugs are not signed.
x. FM 10- Delay in indenting of medicines from IPD/ dispensing of medicines from pharmacy
xi. FM 11- The drugs are not returned back to the pharmacy
xii. FM 12- the current medications are not mentioned in the initial assessment form and/or if mentioned not marked as ‘to be continued or not in the hospital’.

**FMEA Scoring**

**Step 3. Severity rating**:

TABLE 1.

| **Rating** | **Criteria/ Risk** | **Description (Severity of Failure)** |
|---|---|---|
| **10** | Dangerously high | Failure could cause terminal injury or death of the patient |
| **9** | Extremely high | Failure involves regulatory noncompliance and could cause long term disability. |
| **8** | Very high | Failure causes patient's health to be seriously affected and patient has to return for major correction. |
| **7** | High | Failure seriously affects patient's health leading to high patient dissatisfaction. |
| **6** | Moderate | Failure causes disruption of patient activities of daily living leading to dissatisfaction |
| **5** | Low | Inconvenience for patient and provider with failure being detected. |
| **4** | Very Low | Inconvenience at subsequent function; minor rework. Failure detected and corrected at subsequent step of the process. |
| **3** | Minor | Slight inconvenience at next function; minor rework. |

| | | |
|---|---|---|
| | | Failure detected and corrected at next step of the process. |
| **2** | Very Minor | Slight inconvenience at delivery; minor rework. Failure detected and corrected at delivery. |
| **1** | None | No noticeable effects |

The severity scale used can range from a slight annoyance within the system, which may rank as a 1, to terminal injury or death, which would rank as a 10.

**Step 4: Frequency rating:**

**TABLE 2.**

| **Criteria/ risk** | **Rating** | **Description (Probability of failure)** |
|---|---|---|
| Dangerously high | **10** | Failure is almost inevitable. More than one occurrence per day |
| Extremely high | **9** | One occurrence every three to four days |
| Very high | **8** | High: repeated failures, one occurrence per week |
| High | **7** | One occurrence every month |
| moderate | **6** | Moderate: occasional failures, one occurrence every three months |
| | **5** | One occurrence every six months to one year |
| | **4** | One occurrence per year |

| | | |
|---|---|---|
| low | **3** | Low: relatively few failures, one occurrence every one to three years |
| Very low | **2** | One occurrence every three to five years |
| none | **1** | Remote: failure is unlikely, one occurrence in greater than five years |

The frequency/occurrence scale addresses the likelihood and probability of the failure mode's occurrence. The likelihood should range from remote/none, with a score of 1 to dangerously high, with a score of 10.

**Step 5. Detection Rating**:

TABLE 3

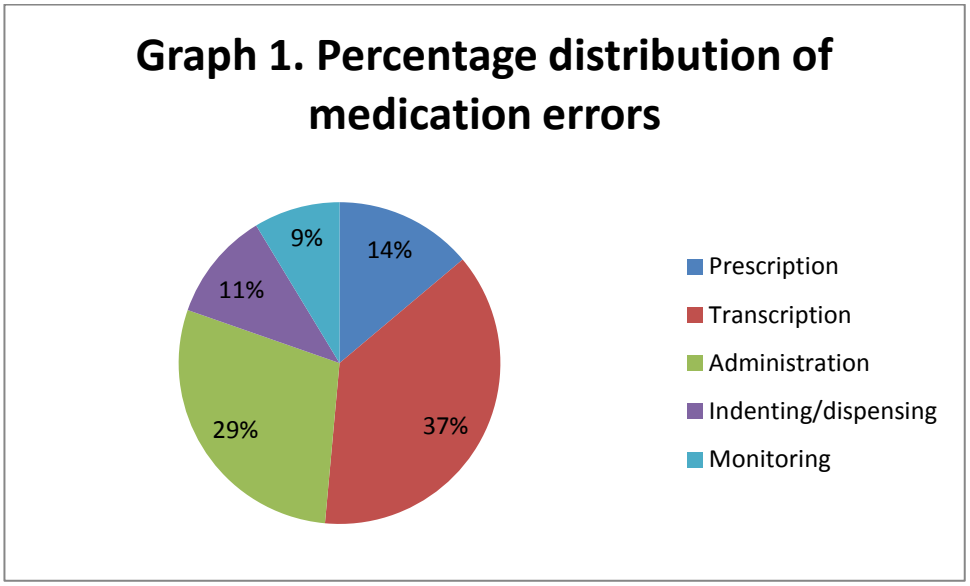
| **Rating** | **Criteria/risk** | **Description (Detection of failure)** |
|---|---|---|
| **10** | Absolute Uncertainty | Controls will not or cannot detect the existence of a failure. No known controls available to detect failure mode. |
| **9** | Very Remote | Controls probably will not detect the existence of failure mode. Control achieved with indirect or random checks only. |
| **8** | Remote | Controls have a poor chance of detecting the existence of failure mode. |
| **7** | Very Low | Controls have a low chance of detecting the existence of failure. |

| | | |
|---|---|---|
| **6** | Low | Controls may detect the failure. |
| **5** | Moderate | Controls may detect the existence of a failure mode. Error likely to be detected after service delivery. |
| **4** | Moderately High | Controls have a good chance of detecting failure mode. Error detection at service delivery. |
| **3** | High | Controls have a very good chance of detecting failure mode, error detection at subsequent steps. |
| **2** | Very High | Current controls almost certain to detect the failure mode. Process automatically detects failure mode. |
| **1** | Almost Certain | Current controls almost certain to detect the failure mode. Reliable detection controls are known with similar processes. Process automatically prevents further processing. |

The detection scale rates the likelihood of the failure being detected, from very high, with a score of 1, to remote, with a score of 10.

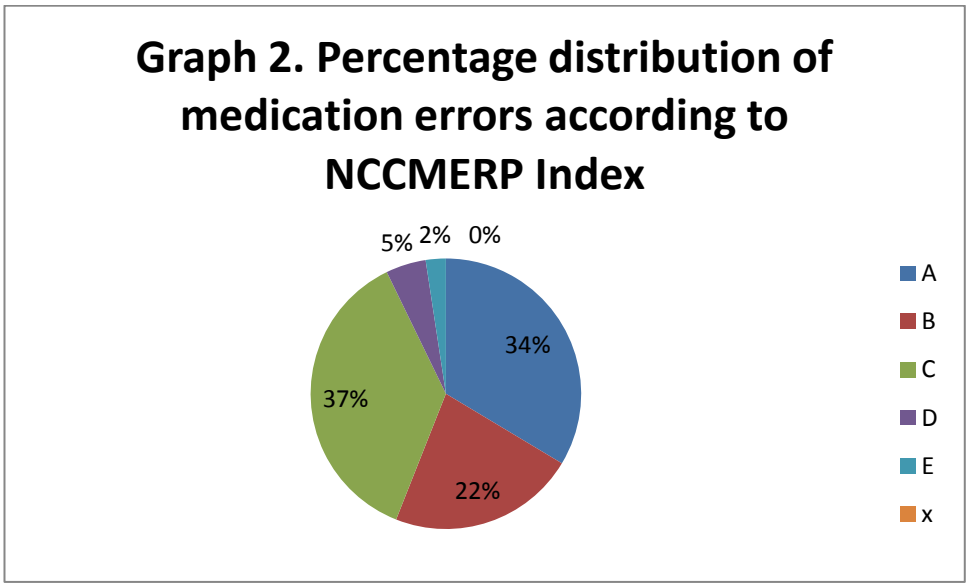
**RESULTS:**

**Graph 1.**




Graph1. The above graph indicates the percentage distribution of medication errors according to which the maximum percentage was found to be of transcription errors (37%) followed by administration errors (29%) indicating the need to identify the causes and effects of their occurrence.

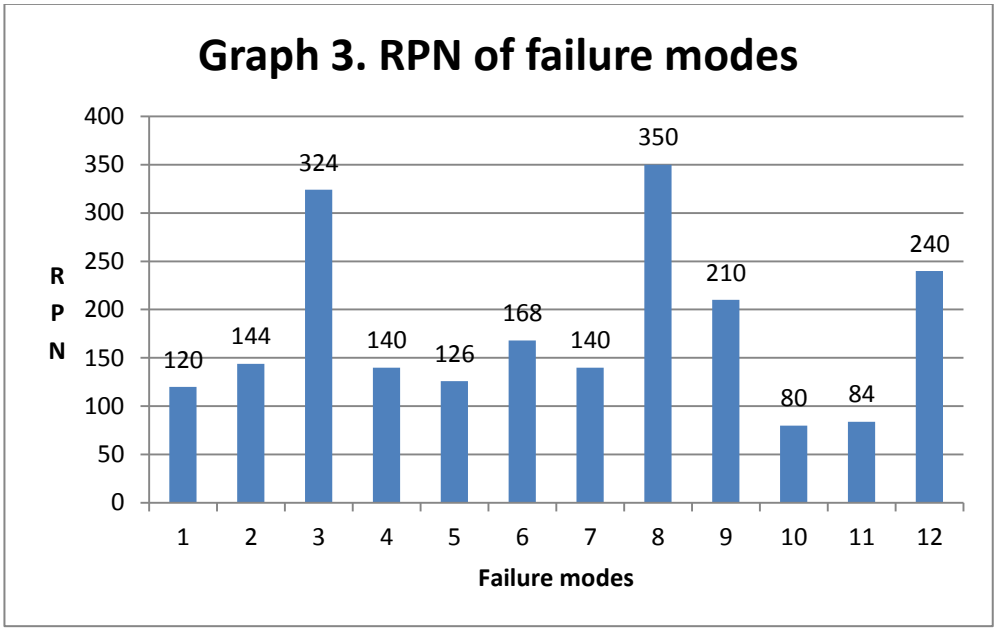
Graph 2.



Graph 2 The above graph indicates the percentage distribution of medication errors according to NCCMERP Index. The maximum percentage of errors were found to be of category C which is 'an error occurred that reached the patient but did not cause patient harm' followed by category A which is 'circumstances or events that have the capacity to cause error'. Category x denotes categories F,G,H,I which were found to be 0%.

From the FMEA matrix, twelve failure modes were identified in the medication management process.

Graph 3.




Graph 3. showing RPN for the failure modes

Step 8:

The above graph 3. shows the major five failure modes based on the risk priority number (RPN) which are as follows:

a. FM 3- the medicine is transcribed wrongly on the treatment sheet (RPN-324)
b. FM 6- wrong medicine/dose/form is dispensed by the pharmacy (RPN-168)
c. FM 8- incorrect administration time listed in the MAR (RPN-350)

d. FM 9- the new/changed medicines are not added after the consultants round and the stopped drugs are not signed (RPN-210)
e. FM 12- the current medications are not mentioned in the initial assessment form and/or if mentioned not marked as 'to be continued or not in the hospital' (RPN-240)

**Step 6,7: FMEA matrix**

The FMEA matrix below shows various Failure Modes, their causes, effects and the corresponding RPN for each of the failure mode.

From the above matrix we can conclude that the most common cause of these failure modes are:

a. Illegible handwriting: which includes use of incorrect abbreviations, confusion between drugs with similar names, misuse of zeroes and decimal points, confusion of metric and other dosing units.
b. Miscommunication of drug orders
c. Non adherent to policies and procedures
d. Negligence (Performance deficit, knowledge deficit, mental slip)

**<u>Cause Effect Analysis of failure modes in MMP</u>**:

1. **People**
    - Language barrier
    - poor handwriting of doctors
    - drug was given but not documented and vice versa
    - miscommunication of drug orders
    - Incorrect drug administration times are listed.

2. **Procedure**
    - failure of cross checking of orders
    - lack of proper labelling of drugs
3. **Policy**
    - non-compliance/ non adherence to policies and protocols
4. **Others**
    - performance deficit
    - mental slip
    - knowledge deficit
    - fear of punishment of reporting of errors.

## RECOMMENDATIONS

1. **Computerised Physician Order Entry (CPOE)**: CPOE's are desk top electronic devices physicians are equipped with to enter medication prescriptions. The orders are usually integrated with patient information and automatically checked for errors or adverse interactions. This not only eliminates the guess work in deciphering handwritten dosage and medications but also provides an additional layer of verification for appropriate medication and dosage. As physicians enter prescription orders into an automated prescribing system, errors are detected at the time medications are ordered. The orders are then integrated with patient information and automatically checked for potential errors, complications, or adverse effects. The CPOE assists each physician analyse patient records while prescribing appropriate medications. Linked to a central database, physicians are alerted to adverse drug-to-drug interactions as well as inappropriate dosages which prompt the physician to reselect correct medication and dosage amounts.

Advantages of CPOE:

CPOE systems improve safety in several ways.

- First, all orders standardized to include a dose, route and frequency.
- Second and perhaps most critical, orders are legible (transcribed) and can be identified by the pharmacist in all instances.
- Third, information can be accessed by the pharmacist at any time during the process.
- Lastly, all orders can be checked for a number of problems including allergies, drug interactions, overly high doses, drug laboratory problems (giving a patient a drug when they have a known biochemical factor that predisposes them to risk), and whether the dose is appropriate for the patient's condition.

Disadvantages of CPOE:

The CPOE is very useful in inpatient units but present several possible dangers by introducing new types of errors such as:

- Slower order entry by prescribers
- Utilizes more staff time
- Slower person to person communication in an emergency situation
- Default selections can override nonstandard medication regimens for elderly and overweight patients which resulted in toxic doses
- Frequent alerts and warning can interrupt work flow.

Computerised physician order entry (CPOE) are promising systems, but need to be balanced against an initial expenditure that must be borne for long term benefits, which in turn need to be monitored and measured.

**COMPUTER ON WHEELS (COW) -** are laptops or small PCs that are mounted onto desks with wheels. COWs are being used in hospitals by medical personnel to track

patient admissions and records. The COWs used in hospitals are usually equipped with EMR and DSS systems and can be connected to non-networked diagnostic equipment. The main users of COWs are nurses who go from room to room in the hospital to see patients. Nurses will pull their cart to each patient's bedside and use it as necessary.

COWs also retain the uses of a regular computer. Some COWs even have drawers to hold medicine and other medical supplies such as gauze.

**Applications:**

- Connects to hospitals wireless network and automatically updates EMRs/DSSs
- Nurses can create and edit EMRs at bedside and access DSSs
- Shows lab results to nurses
- Connects to diagnostic equipment and downloads diagnostic information (Ex's: Blood Pressure, Temperature)
- Holds prescription medicine and can be used to scan prescriptions before they are given to patients
- Holds other medical supplies such as gauze and

**Advantages**

- Saves money-instead of having a computer in every room, you just have one per nurse on staff. Nurses take care of multiple rooms
- Saves time and lives- Have information at your fingertips instead of waiting on paper charts and physically retrieving lab results.

**Disadvantages**

- Can be bulky in small hospitals
- If left unattended-raises fire code issues probably against fire codes if left in hallway with its charging cord stretching across the hallway
- Raises Security Issues
- Holds Patient Information
- Can Carry Prescription Drugs
- Battery Must Be Charged Constantly
- Personnel has to be trained to use it

2. **Policy for written orders**: sloppy handwritten prescriptions should be replaced by CPOE, a very effective technique for reducing prescribing/ordering errors, but another far less expensive yet effective change would involve writing all drug orders in plain English (basically in uppercase avoiding use of cursive forms), rather than continuing to use the elitist's arcane Latin words and shorthand abbreviations that are subjected to misinterpretation. After all, effective communication is best accomplished when it is clear and simple for ex. Instead of writing frequency as O.D/B.D., once daily/twice daily should be written to avoid miscommunication. The principals of good prescribed orders are:

- Patient demographic details should be clear
- Complete allergy box and alert label
- Use generic drug names
- State drug, dose, strength, route and frequency
- Avoid abbreviations
- Avoid multiple route prescribing (i.e im/sc/po)
- State dose as grams, mg, mcg

- Make administrations of once weekly drugs clear
- To amend a prescribed drug- draw a line through it, date and initial, then rewrite as new prescription.

3. **Labelling of drugs**: there should be proper labelling of drugs when dispensed by the pharmacy including the name and date of manufacturing and date of expiry. If the drug with same name but different dosage form is dispensed against the order indented then the information should be conveyed to the nursing station in written. Breakdown in communication is a common cause of harm to patients and these needs to be addressed at several levels.

4. **Training and motivation**

- Fostering motivation among the staff by ensuring open and non punitive environment for reporting medication errors.
- Organising training sessions regarding the existing medication safety policies for RMO's evidence-based practices.
- Addressing the language barriers among the nursing staff
- Vigorous training sessions for the nursing staff with strict follow-up. Also a proficiency test could be conducted bimonthly or quarterly to assess the knowledge of the staff regarding the policies and the procedures. This would help to evaluate the deficient areas and formulate further action plan.
- Rewarding system (scoring or giving points) for those who report errors.
- RCA (root cause analysis) of all the errors should be done to select the most reasonable cause from the myriad of competing causes. It is generally accepted that adverse events d have causes, and that a careful analysis of the actions of persons and the states of the system in which the event occurred will reveal the causal agents.

5**. Adherent to policies and procedures:**

To ensure proper medication administration the health care worker must adhere to the five rights of medication administration:

- The right medication- double check of the medication received to the medication order is imperative. The administration staff must only give medication they have prepared and be present when it is taken.
- The right dose- to ensure that the right dose is given, the administration staff must double check any calculation and have another team member to check the calculation.
- The right client- the administration staff must identify the patient by checking the medication order and his/her identification band to ensure that the right client is receiving the right medication.
- The right route- the administrator must give the medication via the right route. The double check will identify the route to be given on the medication order.
- The right time- the administrator will check the medication order to ensure that the medication is given at the right time. The prescriber will identify the times that the medication is to be given.

6. **Proper timing of administration** can be maintained by converting a crash cart into a medication cart with the respective drawers containing medication of respective patients. This cart can be moved throughout the IPD area at specific times by the medication administration staff who can simultaneously verify the five R's of right medication.

**CONCLUSION:**

- There are a number of factors at each step of the patient care process that contribute to medication errors.

- Special focus should be given to the prescription and administration phases of patient care due to the large number of errors tracked back to these stages of treatment.
- Policies and procedures are in place; just adherence to them is required. Training and motivation is the need of the hour and should be promptly addressed.
- FMEA is a continuous process which can be continued in phases.
- The recommended actions to be taken along with responsibilities are defined
- The process is repeated to ascertain the effects of actions taken with the aim to reduce the risk priority number.

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