

RESEARCH ARTICLE

Clinical audit of the high risk medications use in pediatric and neonatal intensive care units - Pre and post intervention

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ABSTRACT

Background: Clinical audit is “a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criterion and the implementation of change.” Prescribing of high-risk medications (HRMs) in pediatrics age group can pose a unique set of risk of medication errors, because of the need for individual dosage calculations. **Aim and Objective:** The aim of the study was to evaluate the compliance to institutional guidelines while prescribing HRMs in the Neonatal Intensive Care Unit (NICU) and Pediatric Intensive Care Unit (PICU). **Materials and Methods:** This was a record based retrospective observational study carried out in the NICU and PICU of Shree Krishna Hospital, Karamsad. The standard was evaluated against the four criteria mentioned in the institutional guidelines for the use of HRMs. These criteria were whether HRMs were (1) highlighted with red color in prescription, (2) prescribed in adequate dose, (3) verified by two nurses or doctors before administration, and (4) monitored after administration to the patient. **Results:** A total of 36 and 37 case files were audited during the first and follow-up audit, respectively. The targets of 100% were achieved for criterion 2, 3 and 4 in the first audit as well as follow-up audit. The target of criterion 1 improved from 0% in the first audit to 46.66% in a follow-up audit. **Conclusion:** Regular follow-up audits of HRM use are required to prevent medication errors and adverse drug reactions.


KEY WORDS: Clinical Audit; High-risk Medications; Medication errors

INTRODUCTION

Clinical audit has been defined by the National Institute of Clinical Excellence as “a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criterion and the implementation of change.”^[1]

The United States National Coordinating Council for Medication Error Reporting and Prevention has defined a medication error as: “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 labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use.”^[2]

The Joint Commission on Accreditation of Healthcare Organizations has defined “high-risk/high-alert medications

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(HRMs) as medications involved in a high percentage of medication errors or sentinel events and medications that carry a high risk for abuse, error, or other adverse outcomes.^[3] The examples of HRMs include medications with a low therapeutic index, controlled substances, psychotherapeutic medications, and look-alike and sound-alike medications.^[3,4]

There is limited knowledge available about HRMs for children.^[5] The rate of medication errors and potential adverse drug events (ADEs) is considerably higher in neonates than in other age groups.^[6] There is an increased need for calculations, dilutions, and manipulations of medications for the neonates at each stage of medicine management process which makes them more prone to medication errors.^[7] There is a unique set of risk of medication errors in pediatric age group because of the need to make dosage calculations, which are individually based on the factors such as patients weight, age, and body surface area.^[8,9] This risk is increased while using HRMs in this particular age group. Medication errors can occur at various phases, including prescribing, dispensing, and drug administration.^[10] Looking to all these factors, there is a need to monitor HRM use in pediatric patients to promote patient safety.

A list of “HRMs” has been prepared and is revised by the Pharmacy Committee of Shree Krishna Hospital (SKH), Karamsad, from time to time. A manual for safe prescribing and the utilization of HRMs (SKH/PRO/25) has been prepared by the pharmacy committee under the aegis of Clinical Excellence and Accreditation group (CEA). This institutional manual has been prepared according to NABH guidelines on accreditation standards for hospitals. The procedures and safety measures to be followed while prescribing and administration of HRMs have been mentioned in the institutional manual for safe prescribing and the utilization of HRMs. Compliance to these measures is important to achieve the goal of patient safety.

The present study was done with the objective to evaluate the compliance to above said institutional guidelines while prescribing HRMs in the Neonatal Intensive Care Unit (NICU) and Pediatric Intensive Care Unit (PICU).

MATERIALS AND METHODS

This was a record based retrospective observational study. This study was carried out in the NICU and PICU of SKH, Karamsad, under the aegis of CEA. The clinical audit report was shared with the Institutional Ethics Committee and permission was taken to present the data. The data regarding HRMs use was assessed from the case records in the medical records department.

The standard was set – “To ensure that HRMs are utilized according to the guidelines in the institutional manual for

HRM.” HRM use was assessed against four criteria with the target 100%, as shown in Table 1.

The first three criteria were assessed from the daily notes written by doctors on the case record sheets and nursing notes. The fourth criterion was assessed from documentation of vital parameters or adverse events mentioned in doctor’s notes and nursing charts after administration of the drug.

The first audit for the use of HRM use in NICU and PICU was performed during the period May 2019 to July 2019. The case record files were randomly selected and were audited.

The findings of the first audit were shared with the department of pediatrics. Suggestions and importance to adhere to guidelines were given to them and they had agreed upon too. A follow-up audit was performed to assess the compliance to suggestions given during the dissemination of findings of the first audit. The follow-up audit was performed during the period October 2019 to December 2019.

RESULTS

A total of 36 case files from the NICU and PICU were audited during the first audit and a total of 37 case files were audited during the follow-up audit, as shown in Table 2. The number of cases in which the HRMs were prescribed is shown in Table 2. The frequency of prescribing of various HRMs in NICU and PICU is shown in Table 3. Table 4 shows the comparison of the target achieved in the first audit to follow-up audit. In the first audit, it was found that none of the HRMs was highlighted by red color. In the follow-up audit, 46.66% of HRMs were found to be highlighted with red color. The targets for other criteria like whether the HRMs were prescribed in adequate dose verified by two nurses or doctors before administration and monitoring of the patients after administration of HRMs were found to be achieved 100% in both audits.

Table 1: Criterion for the high-risk medicine use in the Neonatal Intensive Care Unit and Pediatric Intensive Care Unit

Criterion	Target	Source of evidence
Whether the high-risk medications are highlighted with red color in prescription/ drug charts	100%	High-risk medication manual of Shree Krishna Hospital
Whether the high-risk medication is prescribed in adequate dose	100%	Standard guidelines and textbooks of pediatrics and pharmacology
Whether the high-risk medications are verified by two nurses or doctors before administration	100%	High-risk medication manual of Shree Krishna Hospital
Whether the patients are monitored after administering high-risk medications	100%	High-risk medication manual of Shree Krishna Hospital

Table 2: Number of case record files evaluated and cases in which high-risk medications were prescribed

Time	May-July, 2019			Oct-Dec, 2019		
	NICU	PICU	Total	NICU	PICU	Total
No. of case record files evaluated	22	14	36	25	12	37
No. of cases in which high-risk medication was prescribed	10	8	18	6	9	15

NICU: Neonatal Intensive Care Unit, PICU: Pediatric Intensive Care Unit

Table 3: Frequency of prescribing of high-risk medicines

High-risk medication	No. of high-risk medications prescribed (May-July, 2019)		No. of high-risk medications prescribed (Oct-Dec, 2019)	
	NICU	PICU	NICU	PICU
Adrenaline	5	8	5	9
Dopamine	6	3	1	-
KCl	1	3	1	1
Lorazepam	2	3	-	4
Phenobarbitone	1	1	2	-
Dobutamine	1	-	5	1
Midazolam	-	4	1	6
Noradrenaline	-	4	-	4
Digoxin	-	1	-	-
Heparin	-	-	1	-
Insulin	-	-	-	1
Total	16	27	16	25

NICU: Neonatal Intensive Care Unit, PICU: Pediatric Intensive Care Unit

DISCUSSION

In the present study, the targets of 100% for criterion 2, 3, and 4 were achieved in the first audit as well as follow-up audit against our set standard. The target of criterion 1 was improved from 0% in the first audit to 46.66% in follow-up audit.

a. Criterion 1: Whether the HRMs are highlighted with red color in prescription

The highlighting of HRMs with red color in prescriptions and drug charts can help the health-care professionals to take adequate safety measures and reduce medication errors while administering them.

In this study, none of the HRMs was found to high lightened with red color in the first audit. However, the positive impact was noticed after the meeting and dissemination of the findings of the first audit to the clinicians, residents, and nursing staff of the pediatrics department. In follow-up audit, 46.66% of the case files were found to be having HRMs high lightened with red color. The follow-up audit findings were shared with the pediatrics department and suggestion was given to further improve the practice of highlighting HRMs with red color.

b. Criterion 2: Whether the HRMs are prescribed in adequate dose

Dosing errors are the most commonly reported medication error in the pediatric age group. The prevention of dosing errors is an important part of ensuring safe and quality patient care in the pediatric population.^[8] Several studies suggest that about one-third of ADEs are associated with medical errors and are thus preventable.^[6] The studies by Patel *et al.* 2016 and Parihar *et al.* 2008 have documented medication errors to be 36% and 35.5% in pediatric settings, respectively.^[11,12]

In this study, the target for criterion 2 was achieved in 100% cases in which HRMs were prescribed. This suggests that adequate safety measures and checks are being taken by health-care professionals of NICU and PICU while prescribing HRMs.

c. Criterion 3: Whether the HRMs are verified by two nurses or doctors before administration

One of the contributing factors for medications errors is considered to be a lack of checking habits. Double-checking of medication before administration is the safety intervention frequently called for, especially to prevent administration errors.^[13,14] Double-checking of medication can reduce administration errors by ensuring the accuracy of the dose, frequency, and route of administration. The implementation of double-checking method should be stressed at the undergraduate level of professional education.^[14,15] In a study by Conroy *et al.* 2012, the rate of double-checking in a neonate's unit for oral medications and IV was found to be 67% and 76%, whereas for children's unit was 68% and 88%, respectively.^[14,16]

In this study, the target of criterion 3 was achieved in 100% cases in which HRMs were prescribed. This suggests that double-checking method is being adequately implemented by health-care professionals in NICU and PICU.

d. Criterion 4: Whether the patients are monitored after administering HRMs

High-risk drugs such as heparin, warfarin, insulin, chemotherapy drugs, potassium chloride (IV), opioids, neuromuscular blockers, anticoagulants, and adrenergic agonists account for 65% of serious adverse events. The highest frequency of adverse events associated with HRMs occurs in the ICUs and among patients with unstable hemodynamic status and who are in critical condition, for whom a minor medication error can lead to irreversible complications.^[17] Therefore, the monitoring for adverse events after the administration of HRMs is of critical importance.

Table 4: Target achieved compared to the previous audit in NICU and PICU

Criterion	Target achieved (n=18), n (%) May-July 2019		Target achieved (n=15), n (%) Oct-Dec 2019	
	YES	NO	YES	NO
High-risk medications highlighted with red color in prescription	00 (00%)	18 (100%)	07 (46.66%)	08 (53.33%)
High-risk medications prescribed in adequate dose	18 (100%)	00	15 (100%)	00
High-risk medications verified by two nurses or doctors before administration	18 (100%)	00	15 (100%)	00
Monitoring of patients after administering high-risk medications	18 (100%)	00	15 (100%)	00

NICU: Neonatal Intensive Care Unit, PICU: Pediatric Intensive Care Unit

In this study, the target of criterion 4 was achieved in 100% cases in which HRMs were prescribed. This suggests that adequate monitoring for the vitals and adverse events was done by the health-care staff of NICU and PICU.

On the literature search, we could not find the articles exactly related to this type of study, that is why we were not able to compare the findings of our study with other studies. However, we could generate awareness regarding the use of HRMs and patient's safety among the pediatricians. This is reflected in the post-intervention findings.

CONCLUSION

The current study shows that adequate monitoring of HRMs is being done in PICU and NICU of SKH, Karamsad. Still, continuous monitoring of HRMs is required in the form of follow-up audits to prevent medication errors and adverse drug reactions.

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