

Original Article

Perception of Nurses Regarding Medication Administration Error in Neonatal units, Tertiary Care Hospital, Pakistan

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Abstract

Background: The occurrence of medication administration errors (MAEs) is a worldwide problem in many health services, increasing the likelihood of medication-related adverse outcomes. Neonate patients, due to unique characteristics, are more vulnerable to drug reactions. A routine work of nurses is medication administration, which is a complicated process. The nurses' perception regarding medication administration error in neonates is unknown.

Objective: This study aimed to identify nurses' perceived reasons contributing to medication administration errors and their under reporting in neonatal units.

Study Design: A cross-sectional descriptive study was conducted.

Place and duration of study: The study was carried out in the neonatal units of Children's Hospital Lahore, a tertiary care hospital, from January to April 2026.

Material and Methods: The study adopted a cross-sectional descriptive design. Ninety registered nurses (RNs) working in the neonatal department were approached using convenience sampling. Data were obtained through an adopted questionnaire comprising several sections to explore the MAEs reasons and causes of underreporting. Data were summarized using frequency, percentage, mean and standard deviation.

Results: The highest-rated reasons for MAEs were similar medications' appearance (mean 5.36, SD 0.78), similar names (mean 5.16, SD 0.98), and similar packaging (mean 4.84, SD 1.14). The highest-rated barriers to reporting MAEs were that administration focused on the individual rather than system-related causes (mean 5.11, SD 1.05), lack of positive feedback (mean 4.74, SD 1.38) and fear of being blamed if a patient is harmed (mean 4.71, SD 1.33).

Conclusion: The study provided a useful insight to nursing and administration authorities. Administration authorities must implement standard policies to respond to a drug error. It is needed to develop and implement a non-punitive, blame-free system to document medication-related incidents.

Keywords: Medication administration errors; nurse; perception; neonatal unit; underreporting; patient safety

1. Introduction

A medication error (ME) refers to any preventable error that may occur throughout the medication process, from the prescribing stage to the actual medication administration to patient. ⁽¹⁾ It is a worldwide problem that increases the morbidity and expiration rate as well as the duration and frequency of hospitalization and associated expenses. ⁽²⁾ According to the World Health Organization, medication errors are estimated to a cost of USD 42 billion globally every year. ⁽³⁾ Despite, continuous patient safety initiatives, medication errors remain a major cause of

preventable harm in healthcare system, worldwide.

⁽⁴⁾ These errors require prompt attention from healthcare professionals and executives because they adversely impact patients, health care staffs and hospitals. ⁽⁵⁾

Drug error can occur during any phase of medication process such as during ordering, compounding, distributing or administering. ⁽⁶⁾ In various studies, frequently encountered types of MEs during medication process have been analyzed.

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Incorrect dose, inappropriate choice, erroneous drug, documented sensitivity to drug, omitted dose, mistimed drug, inappropriate dosing schedule, improper technique, preparation error, pharmacological interaction, wrong route, inaction on test findings, equipment failure, insufficient monitoring and others are among the most common reported drug errors. ⁽⁷⁾

In pediatric population MEs are more common and have different features as compare to adult populations. ⁽⁸⁾ Pediatrics possess distinct physiological characteristics such as smaller body mass, maturing body organs, and require dose adjustment based on weight. Consequently, the margin of error should be smaller when administering medication to pediatric population. ⁽⁹⁾ Due to accurate dose calculation, small therapeutic index, and drugs dilution heightens the chances of drug error during both prescription and administration. ⁽⁸⁾

The prevalence of MAEs among neonates was examined in recent meta-analysis which reported median error rate for direct observation studies was 59.3% and the rate of MAEs ranged between 8.2% and 94.9% across both direct and indirect observation studies. ⁽¹⁰⁾

According to recent studies both organizational and human factors play significant role in drug errors. ⁽¹¹⁾ These includes similar drug packaging, unclear doctor's handwriting, prescription errors, inadequate staffing, high workload, lack of training, unclear administration protocols, lack of experience, disruptions during drug administration and overnight shifts. ^(2,5,6,12-14) Cognitive load is yet another critical but neglected factor. Cognitive workload in nurses, depending on the task difficulty, multitasking, time constraints, and emotional stress, has an effect on their performance. Increased cognitive load increases the likelihood of slips, lapses, and erroneous decision-making in administering medications. ⁽¹⁵⁾ Health care professionals in neonate settings often encounter combined difficulties of managing patient loads, delivering complicated and weight based dosages and operating in resource limited environment. ⁽⁹⁾ In NICU, frequently reported

cause of MAEs is error prone environment including administration of bolus via IV route, heavy workload, unclear communication such as transcription error and deficit of knowledge. ⁽¹⁶⁾

The documentation of ME plays a significant role in effective management of these issues as it promotes knowledge acquisition and strengthens awareness of medication safety practice among health care professionals. ⁽¹⁷⁾ Several reasons were identified for the underreporting of MAEs. The most frequent perceived reason was the excessive emphasis by nursing administration on MAEs as an indicator of nursing care quality with greater attention towards individual performance instead of system related issues. ⁽¹⁶⁾ Other main factors contributing to underreporting MAEs are fear of being blamed, unsupportive environment, fear of consequences and limited knowledge about process of reporting. ^(2,5-9,12,14,17,18)

A routine work of nurses is medication administration, which is a complicated process. Nurses have core responsibility for this, which occupies more than up >40% of their daily nursing activities. ⁽¹⁶⁾ In the intensive care unit (ICU), it has been found that 19% of MAEs are potentially fatal, and 42% are substantial or serious enough requiring further life sustaining interventions. ⁽⁶⁾ Clinical nurses often face high patient-to-nurse ratios challenge which coerces them to rapidly administer medication that increases the likelihood of drug errors. Fatigue, shortage of staff and lack of resources further aggravate the problem. ⁽¹⁴⁾ Hence, implementing effective approaches to improve medication safety in critical care settings such as NICU can substantially reduce the harm to patients caused by medication error. ⁽¹⁶⁾

Insufficient clinical experience and insufficient pharmacology and medication safety guideline training continue to be major predictors of medication mistakes. Previous studies have reported that dose calculation errors, infusion device errors, scribbled handwriting, untrained staff, absence of accountability, heavy workload, frequent interruption and errors in interpreting medical abbreviations making increase risk of errors in children compared to adults. ^(7-9,14) New

nurses may struggled with dose calculations, identifying drug interactions, and interpreting unclear orders, leading to unsafe practice with medications.⁽¹⁹⁾ Current surveys conducted in Peshawar on medication error reporting have indicated that nurses encounter several barriers that include fear of retaliation, absence of feedback from the management, and uncertain reporting strategies. These act as deterrents, preventing opportunities for patient safety and quality of care improvement.⁽²⁰⁾

Neonates are extremely vulnerable due to immature organ system, low body weight and need for precise dose calculations, but limited evidence is available in this context. The researcher reported the major reasons of MAEs in neonatal ICU settings were inadequate staffing and similar packaging of drugs. The major barriers to reporting of MAEs were fear of blame and administrative response.⁽¹⁶⁾

Regardless of recognized significance of reporting medication administration errors (MAEs), underreporting remains a serious issue among nurses in Pakistan. Despite the nurses' role in medication administration, the nurses' perception regarding medication administration error in neonates are unknown. The study aims to identify nurse's perceived reasons and under reporting of medication error among neonatology nurses. Nurses are directly involved in patient care and medication administration. This study will guide to implement safety protocols and strategies to prevent MAEs.

2. Materials & Methods

Before commencing study, ethical approval was obtained from the Ethical Review Committee of the College of Nursing, University of Child Health Sciences, Lahore (Ref. No. 47/CON). The ethical consideration adhered in accordance to the ethical principles of Helsinki declaration.⁽²¹⁾ The participants were informed in detail about study's objectives, aim, expected benefits and possible risks. They were also informed about their

voluntary right to discontinue their participation without affecting their professional status or penalty. Informed consents were obtained, and confidentiality was ensured by replacing personal names with coded identifiers and storing data securely. The participant's data was only accessible to the research team.

The study adopted a cross sectional descriptive design. The study was carried out in Children Hospital Lahore, a tertiary care hospital that is a large referral center for pediatrics and neonates in Punjab. This hospital has high neonate patient volume make it optimal setting for investigating perceptions of neonatal nurse. The study period continued from January to April 2026.

The sample size consisted of 90 RNs was calculated using OpenEpi version 3.01, with a population size of 117, anticipated proportion of 50%, 5% margin of error, and 95% confidence level.⁽²²⁾ The calculation was manually verified using Cochran's formula^(23,24), with an estimated proportion of 50%, a margin of error of 5%, and a Z-score of 1.96.

$$n_0 = \frac{Z^2 P(1 - P)}{e^2}$$

This yielded an initial sample size (n_0) of 384.16. Finite population correction was then applied to the accessible population (N) of 117 neonatal nurses using the following formula:

$$n_{adj} = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

The resulting adjusted sample size was 89.86, which was rounded to 90. Convenience sampling technique was used to select 90 nurses from the accessible population, representing a sample rather than a census.

The study included RNs working in Neonatal OPD, ER, ICU and wards who were providing direct care of patient. The target staff nurses were those who had minimum one year and up to more than 5 years of clinical experience. Nursing managers, administrators, interns who had no license and nurses working in other departments were excluded.

Perception of nurses regarding MAEs was measured using adopted self-reported questionnaire the Wakefield MAE Reporting Survey.⁽²⁵⁾ Permission to use questionnaire was obtained from the developer. The questionnaire was originally developed and validated by Wakefield et al and had previously been used among nurses in neonatal intensive care units in Malaysia⁽¹⁶⁾ The original questionnaire consisted of three sections: reasons for MAEs, reasons for non-reporting of MAEs and the percentage of each type of error reported on the unit. The first two sections of the original instrument were adopted for the present study, whereas the third section of the original instrument was excluded because reliable type-wise MAE records were not consistently maintained in the participating neonatal units. Although medication error reporting systems were available, complete records were not maintained. The adapted questionnaire consisted of three sections: Section A, participants' general characteristics; Section B, reasons for MAEs occurrence; and Section C, reasons for underreporting of MAEs. The items in Section B and C were measured using the original six-point Likert Scale ranging from 1 (strongly disagree) to 6 (strongly agree). No translation or back-translation was performed because the questionnaire was administered in English. The adapted questionnaire was pilot tested among 10% of the study population to assess the clarity and comprehensibility of the items and to evaluate

internal consistency using Cronbach's alpha. During pilot testing, the participants were able to understand and respond to the questionnaire items. The questionnaire demonstrated good internal consistency, with a Cronbach's alpha of 0.85. Data was analyzed in terms of descriptive statistics using SPSS version 27.

3. Results

General characteristics of participants

The majority of participants were between 25–29 years of age (62.2%), with diploma qualification (40.0%), and had ≥ 5 years of nursing experience (55.6%). Most nurses had previously experienced MAEs (64.4%), intravenous route was the most frequently reported route of MAEs (56.7%), and the majority had received education on MAEs 1–2 times (58.9%) (Table I)

Table I
General Characteristics of Neonatal Nurses
(N=90)

Demographic Variables	Category	Frequency (%)
Age	≤ 24 years	0(0.0)
	25-29 years	56(62.2)
	30-34 years	29(32.2)
	≥ 35 years	5(5.6)
Education Level	Diploma	36(40.0)
	Post RN	31(34.4)
	Post basic specialization	11(12.2)
	BSN	12(13.3)
Neonatology unit type	OPD	7(7.8)
	Ward	40(44.4)
	ICU	34(37.8)
	ER	9(10.0)
Nursing Experience	1-2 years	21(23.3)
	3-4 years	19(21.1)
	≥ 5 years	50(55.6)

Demographic Variables	Category	Frequency (%)
Experience of Medication Administration Errors (MAEs)	Yes	58(64.4)
	No	32(35.5)
Rout of MAEs	Intravenous: Yes	51(56.7)
	Intravenous: No	39(43.3)
	Oral: Yes	14(15.6)
	Oral: No	76(84.4)
	Subcutaneous: Yes	10(11.1)
	Subcutaneous: No	80(88.9)
	Intramuscular: Yes	21(23.3)
	Intramuscular: No	69(76.7)
Frequency of Education received on MAEs	1-2 times	53(58.9)
	3-4 times	23(25.6)
	≥5 times	14(15.6)

Note. MAEs: Medication Administration Errors; RN: Registered Nurse; BSN: Bachelor of Science in Nursing;

OPD: Outpatient Department; ICU: Intensive Care Unit; ER: Emergency Room.

Nurse's perceived reasons for MAEs in neonatal units

The highest-rated reasons for MAEs were similar medications appearance, names, packaging, many patients receiving similar medications, inadequate staffing, interruptions during medication administration and frequent changes in physicians' orders (Table II).

Nurse's perceived for underreporting of MAEs in neonatal units

The highest-rated barriers were that administration focused on the individual rather than the system, lack of positive feedback, fear of being blamed, excessive emphasis on medication errors and concern about negative attitude from patient and family (Table III).

Table II
Perceived reasons for MAEs in neonatal units (N=90)

No.	Items	Strongly disagree N (%)	Moderately disagree N (%)	Slightly disagree N (%)	Slightly agree N (%)	Moderately agree N (%)	Strongly agree N (%)	Mean	SD
1	The names of many medications are similar.	1(1.1)	1(1.1)	0(0.0)	21(23.3)	25(27.8)	42(46.7)	5.156	0.9820
2	Different medications look alike.	0(0.0)	0(0.0)	1(1.1)	14(15.6)	27(30)	48(53.3)	5.36	0.783
3	The package of many medications is similar.	1(1.1)	3(3.3)	6(6.7)	20(22.2)	29(32.2)	31(34.4)	4.84	1.141
4	Physicians' medication orders are not legible.	23(25.6)	10(11.1)	14(15.6)	22(24.4)	17(18.9)	4(4.4)	3.13	1.595
5	Physicians' medication orders are not clear	8(8.9)	9(10)	25(27.8)	26(28.9)	12(13.3)	10(11.1)	3.61	1.388
6	Physicians change orders frequently	1(1.1)	8(8.9)	14(15.6)	23(25.6)	19(21.1)	25(27.8)	4.40	1.339
7	Abbreviations are used instead of writing the orders out completely.	13(14.4)	14(15.6)	10(11.1)	27(30)	14(15.6)	12(13.3)	3.57	1.601
8	Verbal orders are used instead of written orders	12(13.3)	5(5.6)	10(11.1)	14(15.6)	13(14.4)	36(40)	4.32	1.792
9	Pharmacy delivers incorrect doses to this unit.	39(43.3)	17(18.9)	14(15.6)	9(10)	6(6.7)	4(4.4)	2.30	1.503
10	Pharmacy does not prepare the med correctly.	40(44.4)	17(18.9)	14(15.6)	1(12.2)	6(6.7)	2(2.2)	2.24	1.417
11	Pharmacy does not label the med correctly	47(52.2)	17(18.9)	8(8.9)	10(11.1)	6(6.7)	1(1.1)	2.03	1.369
12	Pharmacists are not available 24 hours a day.	35(38.9)	11(12.2)	5(5.6)	7(7.8)	12(13.3)	20(22.2)	3.11	2.080
13	Frequent substitution of drugs (i.e., cheaper generic for brand names).	16(17.8)	7(7.8)	16(17.8)	29(32.2)	6(6.7)	14(15.6)	3.50	1.619

No.	Items	Strongly disagree N (%)	Moderately disagree N (%)	Slightly disagree N (%)	Slightly agree N (%)	Moderately agree N (%)	Strongly agree N (%)	Mean	SD
14	Poor communication between nurses and physicians.	16(17.8)	17(18.9)	11(12.2)	23(25.6)	15(16.7)	8(8.9)	3.31	1.598
15	Many patients are on the same or similar medications	3(3.3)	3(3.3)	9(10)	22(24.4)	23(25.6)	29(32.2)	4.64	1.308
16	Unit staff do not receive enough in services on new medications	12(13.3)	7(7.8)	25(27.8)	14(15.6)	12(13.3)	18(20)	3.69	1.650
17	On this unit, there is no easy way to look up information on medications.	17(18.9)	13(14.4)	24(26.7)	14(15.6)	12(13.3)	9(10)	3.20	1.582
18	Nurses on this unit have limited knowledge about medications	46(51.1)	14(15.6)	16(17.8)	11(12.2)	1(1.1)	2(2.2)	2.03	1.285
19	Nurses get pulled between teams and from other units	11(12.2)	4(4.4)	11(12.2)	24(26.7)	20(22.2)	20(22.2)	4.09	1.591
20	When scheduled medications are delayed, nurses do not communicate the time when the next dose is due.	23(25.6)	14(15.6)	16(17.8)	13(14.4)	13(14.4)	11(12.2)	3.13	1.737
21	Nurses on this unit do not adhere to the approved medication administration procedure	39(43.3)	18(20)	25(27.8)	5(5.6)	2(2.2)	1(1.1)	2.07	1.149
22	Nurses are interrupted while administering medications to perform other duties.	9(10)	10(11.1)	4(4.4)	13(14.4)	20(22.2)	34(37.8)	4.41	1.728
23	Unit staffing levels are inadequate	6(6.7)	7(7.8)	9(10)	22(24.4)	10(11.1)	35(38.9)	4.44	1.595
24	All medications for one team of patients cannot be passed within an accepted time frame.	13(14.4)	13(14.4)	28(31.1)	18(20)	7(7.8)	9(10)	3.23	1.468
25	Medication orders are not transcribed to the electronic health record correctly.	18(20)	14(15.6)	13(14.4)	16(17.8)	8(8.9)	21(23.3)	3.50	1.837
26	Errors are made in the Medication electronic health record.	34(37.8)	16(17.8)	17(18.9)	10(11.1)	5(5.6)	7(7.8)	2.52	1.596
27	Equipment malfunctions or is not set correctly	16(17.8)	13(14.4)	13(14.4)	22(24.4)	15(16.7)	10(11.1)	3.42	1.629
28	Nurse is unaware of a known allergy	38(42.2)	15(16.7)	16(17.8)	14(15.6)	5(5.6)	2(2.2)	2.32	1.413
29	Patients are off the ward for other care	20(22.2)	14(15.6)	18(20)	24(26.7)	8(8.9)	6(6.7)	3.04	1.513

Note. Values are N (%); Mean and SD are based on a six-point Likert scale (1 = strongly disagree to 6 = strongly agree).

Table III

Perceived causes of underreporting of MAEs in neonatal units (N=90)

No.	Items	Strongly disagree N (%)	Moderately disagree N (%)	Slightly disagree N (%)	Slightly agree N (%)	Moderately agree N (%)	Strongly agree N (%)	Mean	SD
1	Nurses do not agree with hospital's definition of a medication error.	42(46.7)	21(23.3)	0(0.0)	8(8.9)	1(1.1)	2(2.2)	2.01	1.213
2	Nurses do not recognize an error occurred.	49(54.4)	19(21.1)	13(14.4)	7(7.8)	2(2.2)	0(0.0)	1.82	1.087
3	Filling out an incident report for a medication error takes too much time.	23(25.6)	12(13.3)	14(15.6)	25(27.8)	9(10)	7(7.8)	3.07	1.599
4	Contacting the physician about a medication error takes too much time	29(32.2)	19(21.1)	11(12.2)	21(23.3)	8(8.9)	2(2.2)	2.62	1.473
5	Medication error is not clearly defined.	31(34.4)	18(20)	8(8.9)	19(21.1)	8(8.9)	6(6.7)	2.70	1.638
6	Nurses may not think the error is important enough to be reported	39(43.3)	21(23.3)	14(15.6)	10(11.1)	5(5.6)	1(1.1)	2.16	1.306
7	Nurses believe that other nurses will think they are incompetent if they make medication errors	28(31.1)	9(10)	6(6.7)	24(26.7)	12(13.3)	11(12.2)	3.18	1.802
8	The patient or family might develop a negative attitude toward the nurse	8(8.9)	5(5.6)	10(11.1)	22(24.4)	25(27.8)	20(22.2)	4.23	1.507
9	The expectation that medications be given exactly as ordered is unrealistic.	22(24.4)	7(7.8)	19(21.1)	27(30)	9(10)	5(5.6)	3.10	1.515
10	Nurses are afraid the physician will reprimand them for the medication error	31(34.4)	13(14.4)	15(16.7)	25(27.8)	3(3.3)	3(3.3)	2.61	1.451

No.	Items	Strongly disagree N (%)	Moderately disagree N (%)	Slightly disagree N (%)	Slightly agree N (%)	Moderately agree N (%)	Strongly agree N (%)	Mean	SD
11	Nurses fear adverse consequences from reporting medication errors.	18(20)	14(15.6)	14(15.6)	26(28.9)	14(15.6)	4(4.4)	3.18	1.503
12	The response by nursing administration does not match the severity of the error.	9(10)	10(11.1)	24(26.7)	28(31.1)	9(10)	10(11.1)	3.53	1.400
13	Nurses could be blamed if something happens to the patient as a result of the medication error	3(3.3)	4(4.4)	7(7.8)	21(23.3)	22(24.4)	33(36.7)	4.71	1.334
14	No positive feedback is given for passing medications correctly.	3(3.3)	4(4.4)	9(10)	18(20)	19(21.1)	37(41.1)	4.74	1.378
15	Too much emphasis is placed on med errors as a measure of the quality of nursing care provided.	2(2.2)	7(7.8)	11(12.2)	24(26.7)	26(28.9)	20(22.2)	4.39	1.296
16	When med errors occur, nursing administration focuses on the individual rather than looking at the systems	0(0.0)	2(2.2)	4(4.4)	21(23.3)	18(20)	45(50)	5.11	1.054

Note. Values are N (%); Mean and SD are based on a six-point Likert scale (1 = strongly disagree to 6 = strongly agree).

4. Discussion

The present study explored the perception of nurses regarding MAEs in neonatal units. The study findings show that nurses perceived both medication and system related factors are major contributors to MAEs. When it comes to reporting, the results indicate that errors are often underreported due to administrative response, organization culture and punitive environment.

Nurse's perceived reasons for MAEs in neonatal units

The present study found that medication related factors such as Look-alike medications, similar names and packaging of drugs are top perceived causes of MAEs. The present findings are aligned with previous studies ^(2,6,20) showing a strong agreement among nurses that these factors increases the likelihood of MAEs, particularly in neonatal setting, where accurate selection of medication and weight based dose calculation are essential. Similarly, system related factors have been identified as important contributing factors such as heavy workload, insufficient nursing staff, frequent interruption during medication administration and nurses being pulled between units were highly reported in current study. These

results are supported by previous studies, which reported that excessive workload, insufficient staffing and recurrent disturbance reduce the nurse's concentration and increase the occurrence of MAEs. ^(6,9,12,20) These findings highlight the need for adoption of standardized drug safety protocols, double checking of high risk medications, adequate nurse staffing and minimizing interruption during medication administration to improve patient safety in neonatal units.

Nurses' perceived reasons for underreporting of MAEs

The present study findings highlighted the administrative action as a significant contributor to underreporting of MAEs in neonatal units. Previous studies have reported similar results; punitive administration practices discourage nurses from reporting of MAEs. ^(5,16,20) In addition, fear of blame, lack of positive feedback and the perception that "MAEs as measure of quality of nursing care" are important barriers to reporting. Similarly, several studies reported that fear of blame was another contributing factor related to underreporting of MAE, where nurses reluctant to report medication errors due to concern about

punitive responses and limited managerial support.^(6,9,16,20) An important finding of this study shows the mean score “for patient or family might develop a negative attitude toward the nurse” is slightly higher than previous studies indicating greater concern for reputational harm in healthcare setting. These findings highlight the necessity for developing and implementing non punitive, blame free and supportive medication error reporting system.

Strengths

A validated questionnaire was used to explore nurses’ perceptions on causes of occurrence and underreporting of MAEs. This study focuses on specific neonatal population, where evidence is still limited.

Conclusion

In the current study, similarity in drugs, different medications look alike, similarity in packaging, inadequate staffing and heavy workload are primary perceived causes of MAEs in neonatal setting. The most frequently stated reasons of under reporting of drug error are administrative responses related to drug error occurrence, fear of punitive consequences and absence of supportive feedback on accurate medicine administration practices.

Limitations

The study was exclusively conducted in a single hospital and convenience sampling was used, which may restrict the applicability of study findings. A cross-sectional approach was used to collect responses that provide only one-time data and do not address changes over time. A further limitation is the potential for social-desirability bias in self-reported reasons for underreporting MAEs, which may have resulted in conservative estimates of these barriers.

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No conflict of interest disclose by authors.

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