IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 12 Ser. 6 (December. 2025), PP 13-19
www.iosrjournals.org

Assessing Medication Administration Knowledge Among Nurses At A Hospital: A Mixed-Methods Quality Improvement Study

Md. Golam Kibria
(Grameen Caledonian College Of Nursing, Dhaka, Bangladesh)

Abstract
Background: *Medication administration errors continue to be a significant challenge in nursing practice globally, as well as in Bangladesh.*
Objective: *This study aimed to assess the knowledge regarding medication administration among nurses at a hospital and evaluate the effectiveness of an educational intervention based on the Plan-Do-Study-Act (PDSA) cycle.*
Methods*: This mixed-methods quality improvement study was conducted in Dhaka Medical College Hospital between September and November 2023. A convenient sample of 17 senior nurses participated in needs assessment, pre-test, educational sessions, supervision, and post-test phases in quantitative data, and qualitative data were collected purposively from 17 nurses through semi-structured interviews and supervisor feedback.*
Results: *Results showed significant improvements in knowledge scores post-intervention, with excellent knowledge increasing from 20% to 30% and poor knowledge decreasing from 50% to 10%. Despite these gains, systemic challenges such as the absence of electronic prescribing systems and the reluctance to report errors persist.*
Conclusion: *The findings underscore the need for ongoing training, implementation of electronic medication management, and development of a non-punitive error reporting culture to enhance medication safety in hospital settings.*
Keywords: *medication administration, nursing knowledge, educational intervention, patient safety*

Date of Submission: 09-12-2025 Date of Acceptance: 19-12-2025

I. Introduction

Medication administration errors (MAEs) are a persistent global patient safety concern, often resulting from inadequate knowledge, communication failures, and system deficiencies (Al-Ahmadi et al., 2021; Mohammad et al., 2022). Studies from countries including Jordan, Saudi Arabia, and Iran report MAE rates ranging between 20% and 40%, illustrating widespread challenges in nursing practice (Mohammad et al., 2022; Al-Ahmadi et al., 2021). The Medication Administration Record (MAR), a critical tool in medication management, is often underutilized or inconsistently applied, contributing to errors.

A recent cross-sectional study by Alomari and Shdaifat (2023) revealed that nurses' perceptions of medication safety culture significantly influence their adherence to safe medication practices. Their findings emphasized that fostering a positive safety culture through leadership support, continuous education, and open communication reduces error occurrence and enhances reporting behaviors.

Similarly, Smith et al. (2018) identified that ongoing professional development and structured training significantly improve nurses' medication safety knowledge and confidence. In contrast, Li and Cheng (2022) found that systemic barriers, such as lack of electronic documentation systems and staffing shortages, continue to hinder medication safety, particularly in resource-limited hospitals. These findings parallel the situation in Bangladesh, where medication safety is often compromised by manual recordkeeping, limited supervision, and insufficient continuing education for nurses.

In Bangladesh, limited but growing research highlights similarly concerning rates of MAEs. At Dhaka Medical College Hospital, preliminary assessments indicate approximately 74% of senior nurses have been involved in medication errors, with 80% expressing low confidence in medication safety practices. These local data highlight the urgent need for targeted interventions in the context of resource constraints and cultural barriers, such as reluctance to report errors and the absence of electronic prescribing systems.

While complete elimination of medication errors may not be feasible, quality improvement frameworks like Plan-Do-Study-Act (PDSA) cycles offer structured approaches to identify and address gaps (Moen, 2009). This study aimed to assess the current state of medication administration knowledge among senior nurses at Dhaka

Medical College Hospital and evaluate the impact of an educational intervention designed using the PDSA framework.

II. Methods

Study Design and Setting: This mixed-methods quality improvement study was conducted in Dhaka Medical College Hospital between September and November 2023. The study integrated quantitative data from structured questionnaires and qualitative insights from semi-structured interviews.

Participants and Sampling: Seventeen (17) nurses were conveniently selected based on their direct involvement in medication administration. The study focused on nurses because they are directly responsible for supervising junior nurses and are often the final checkpoint in the medication administration process. Their knowledge, decision-making, and leadership behaviors critically influence medication safety outcomes. Although the small sample size (n = 17) limits generalizability, this group was purposively chosen to generate in-depth insights into the quality of medication administration practices within a high-volume tertiary care hospital setting. Inclusion criteria included having at least six months of clinical experience and willingness to participate. Nurses on leave or with administrative roles were excluded.

Data Collection Instruments and Validation: Demographic characteristics of participants included questions about age, gender, years of experience, and educational qualification. A 15-item questionnaire was used to identify baseline knowledge gaps or need assessment in medication safety domains, such as dosage calculation, documentation, and handling high-risk medications. A 20-item pre-test and post-test questionnaire measured nurses' knowledge before and after the educational intervention. The questionnaire was adapted from previously validated tools (Kohn et al., 2001; Smith et al., 2018) and modified to fit the local context after expert review by three nursing educators and one clinical pharmacist. A pilot test was conducted with five nurses from a non-participating ward to ensure clarity and relevance. Cronbach's α was calculated at 0.82, indicating acceptable internal consistency. Content validity was established through expert panel feedback and consensus. Semi-structured interview explored nurses' experiences, perceptions, barriers, workload, and continuous improvement related to safe medication administration.

Data Collection: Data were collected at Dhaka Medical College Hospital using a mixed-methods approach that integrated quantitative and qualitative data. The study followed the PDSA cycle (Figure 1):

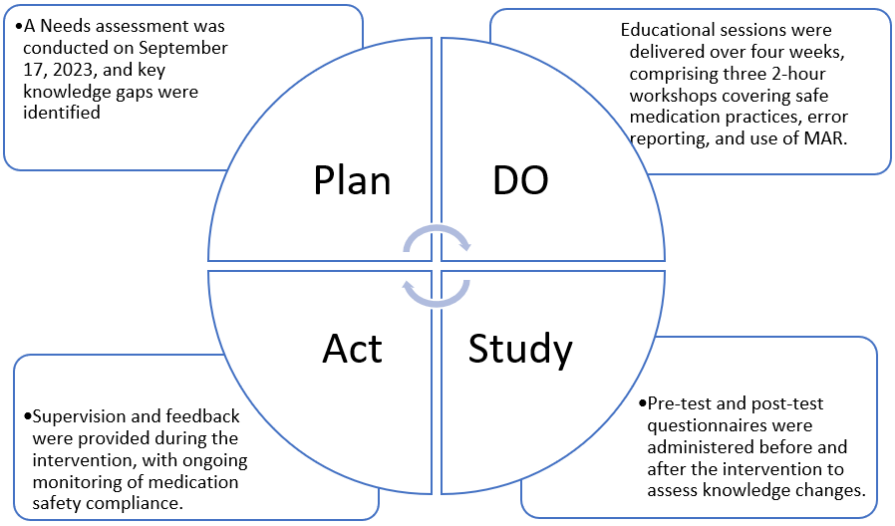

Figure 1: Plan-Do-Study-Act (PDSA) cycle (Moen, 2009)

- Plan: A Needs assessment was conducted on September 17, 2023, and key knowledge gaps were identified.
- Do: Educational sessions were delivered over four weeks, comprising three 2-hour workshops covering safe medication administration, error reporting, and use of MAR.
- Study: Quantitative data were gathered conveniently from 17 nurses through pre-test and post-test knowledge assessments using a 20-item validated questionnaire. After that, qualitative data were collected purposively from 17 nurses through semi-structured interviews.
- Act**:** Supervision and feedback were provided during the intervention, with ongoing monitoring of medication safety compliance.

Data Analysis: The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25 for both descriptive and inferential statistics. Quantitative data from pre- and post-tests were analyzed with paired t-tests to evaluate knowledge improvements. Qualitative data from interviews and supervision feedback were thematically analyzed following Braun and Clarke (2006) to interpret the feedback and survey data, resulting in key themes such as systemic barriers, reporting culture, and workload pressures. Quantitative and qualitative data were triangulated during the interpretation phase. Improvements in knowledge scores were examined alongside qualitative themes derived from participant interviews to provide a holistic understanding of the intervention's effectiveness and contextual barriers to safe medication administration.

Ethical Consideration: Ethical permission to conduct this study was obtained from the institutional ethical committee (Ref. IREC/2023-10). All the participants were informed about the study and its purposes, and informed consent was obtained from all the participants before commencing the data collection.

III. Results

Quantitative Phase:

Table 1: Knowledge Gaps Identified in the Needs Assessment (N = 17)

Knowledge Area	No. of Nurses with Gap (n)	Percentage (%)	Description of Gap Identified
Medication dosage calculation	12	70.6%	Difficulty calculating pediatric and weight-based doses
Documentation accuracy	10	58.8%	Failure to record medication administration immediately after delivery
"Five rights" of medication administration	8	47.1%	Incomplete recall of all five rights or inconsistent application
High-risk medication handling (e.g., insulin)	9	52.9%	Lack of knowledge on double-checking and safe storage
Adverse drug reaction recognition	7	41.2%	Limited ability to identify and respond to early signs of adverse reactions
Patient education on medication use	6	35.3%	Insufficient explanation to patients about the drug's purpose and side effects

Table 1 presents that the majority (70.6%) of participants had gaps in dosage calculation, followed by documentation accuracy (58.8%) and high-risk medication handling (52.9%).

Table 2: Demographic Characteristics of Participants (N = 17)

Demographic variables	Categories	n	%
Age (years)	21–25	5	29.4
	26–30	8	47.1
	>30	4	23.5
Gender	Female	14	82.4
	Male	3	17.6
Years of Nursing Experience	< 2 years	6	35.3
	2–5 years	7	41.2
	> 5 years	4	23.5
Educational Qualification	Diploma in Nursing	8	47.1
	BSc in Nursing	9	52.9

Table 2 shows that most participants were female (82.4%) and aged between 26–30 years (47.1%). More than three-quarters (76.5%) had less than five years of nursing experience. Just over half (52.9%) held a BSc in Nursing.

Table 3: Knowledge Assessment on Safe Medication Administration (N = 17)

Knowledge Domain	Mean Score	SD
Dosage Calculation Accuracy	6.2	1.4
Medication Administration Rights	7.1	1.2
High-Risk Medication Handling	5.4	1.6
Documentation and Record Keeping	6.0	1.3
Medication Storage and Labelling	7.5	1.1

Table 3 shows the nurses' knowledge levels across different medication administration domains. They strongly understand medication storage and labeling (mean 7.5, SD 1.1) and medication administration rights (mean 7.1, SD 1.2). Moderate knowledge was observed in dosage calculation accuracy (mean 6.2, SD 1.4) and

documentation and record keeping (mean 6.0, SD 1.3), with some variability among participants. The lowest scores were in high-risk medication handling (mean 5.4, SD 1.6).

Table 4: Medication Administration Knowledge Scores Pre- and Post-Intervention (N=17)

Knowledge Level	Pre-Test (%)	Post-Test (%)
Excellent	20	30
Good	40	60
Poor	50	10

Table 4 presents that before the training, only 20% of participants demonstrated excellent knowledge (≥80%), which increased to 30% after the intervention. Those with good knowledge (60–79%) rose significantly from 40% pre-test to 60% post-test. Conversely, the proportion of nurses with poor knowledge (<60%) decreased markedly from 50% before the intervention to just 10% afterward.

Table 5: Comparing Pre-Test and Post-Test Knowledge Scores

Measure	N	Mean	SD	Paired t-Test	df	p-value
Pre-Test Score	17	58.3	12.5	4.76	16	< .001
Post-Test Score	17	72.8	10.2			

Table 5 shows that there was a significant increase in scores from pre-test (M = 58.3, SD = 12.5) to post-test (M = 72.8, SD = 10.2), $t = 4.76$, $p < 0.001$, indicating the intervention effectively improved nurses' knowledge.

Qualitative Phase:

Qualitative data collected from participants were analyzed thematically to explore barriers and facilitators related to medication administration practices among nurses. Thematic analysis followed Braun and Clarke's (2006) six-step approach (Figure 2). Credibility was enhanced through member checking; three participants reviewed and summarized themes to verify accuracy. Dependability and confirmability were supported through audit trails and peer debriefing with a senior nursing researcher. Reflexivity was maintained through journaling during data interpretation to minimize bias. The results were categorized into five major themes with related subthemes emerging from the data analysis, as shown in Table 6.

Figure 2: Braun and Clarke's (2006) framework for thematic analysis

Table 6: Themes and subthemes emerged from the data

Themes	Subthemes
Systemic Challenges in Medication Administration	Reliance on paper-based systems Lack of electronic prescribing and administration records Limited access to updated guidelines Impact on efficiency and workload
Cultural Barriers to Error Reporting	Fear of punishment Stigma and reputation concerns Culture of silence
Knowledge Gaps and Need for Continuous Education	Limited understanding of safe medication practices Inadequate familiarity with MAR and documentation tools Demand for regular refresher training
Workload and Communication Issues	Understaffing and high patient ratios Time pressure and task overload Poor interprofessional communication
Opportunities for Improvement	Implementation of electronic prescribing systems Supportive and non-punitive leadership Error reporting and learning culture Team-based safety strategies

Theme 1: Systemic Challenges in Medication Administration. Participants consistently highlighted infrastructural and process-related barriers impacting safe medication administration. These included the reliance on paper-based documentation systems, the absence of electronic prescribing and administration records, and

insufficient availability of updated medication guidelines. Nurses reported that these systemic limitations increased workload, contributed to documentation errors, and reduced overall efficiency.
"Without electronic systems, it is difficult to track medications accurately, leading to mistakes, especially during busy shifts." (P5)
"No electronic prescribing increases mistakes." (P7)
"Nurses avoid reporting errors fearing consequences." (P11)
"Too many patients, not enough time; errors happen." (P14)

Theme 2: Cultural Barriers to Error Reporting. A prominent theme was the reluctance among nurses to report medication errors due to fear of blame and punitive consequences. This culture of silence impeded transparent communication and learning from mistakes, which are critical for improving patient safety.

"Many nurses avoid reporting errors because they worry about punishment or damaging their reputation." (P11)

Theme 3: Knowledge Gaps and Need for Continuous Education. While nurses demonstrated some baseline knowledge, participants acknowledged significant gaps in understanding safe medication practices, error prevention, and the use of documentation tools like the Medication Administration Record (MAR). Many expressed a desire for ongoing education and refresher training to keep abreast of best practices.
"Regular workshops would help us stay updated and reduce errors caused by a lack of knowledge." (P8)

Theme 4: Workload and Communication Issues. Heavy workloads and poor communication among healthcare teams emerged as important barriers to safe medication administration. Participants noted that understaffing and task overload led to rushed medication rounds, increasing the risk of errors.
"Sometimes we have too many patients and not enough time, so mistakes happen unintentionally." (P14)

Theme 5: Opportunities for Improvement. Despite challenges, nurses identified opportunities to enhance medication safety through implementing electronic prescribing systems, fostering supportive leadership, and creating a blame-free environment encouraging error reporting and learning.

"If management supports us with better tools and encourages open discussions about errors, we can improve patient safety together." (P3)

Thematic analysis revealed that medication administration safety is influenced by interconnected systemic, cultural, and educational factors. Addressing infrastructure gaps, transforming error reporting culture, enhancing education, and managing workload are crucial for improving nursing practice and patient outcomes at Dhaka Medical College Hospital.

SWOT Analysis: The SWOT method has application to at least four components of human performance. SWOT analysis may have applications within appreciative inquiry, benchmarking, industry analysis, situation analysis, and scenario planning. Figure 3 shows four components of SWOT analysis, which are Strengths: Skilled nursing staff with dedicated patient care attention, Weaknesses: Reliance on paper-based systems, poor communication, Opportunities: Potential for electronic systems integration, training expansion, and Threats: Resistance to change, impending staff retirements.

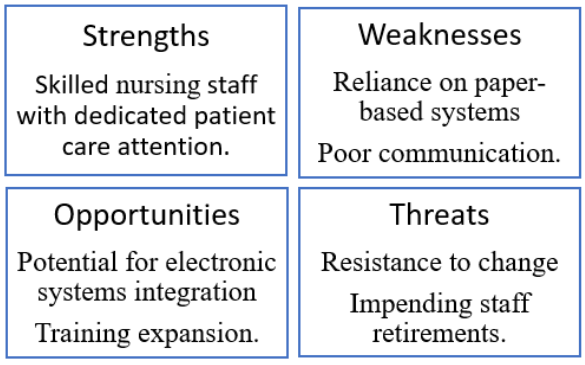

Figure 3: SWOT analysis

IV. Discussion

This mixed-methods study revealed that a structured educational intervention using the PDSA framework significantly improved nurses' knowledge regarding medication administration. The improvement in

post-test scores corroborates prior research demonstrating the effectiveness of educational interventions for enhancing medication safety competencies (Mohammad et al., 2022; Smith et al., 2018).

The results of this study align with emerging international evidence emphasizing the influence of education, culture, and systemic support on medication safety outcomes. Similar to the findings of Alomari and Shdaifat (2023), nurses in this study demonstrated improved awareness following educational interventions, highlighting that strengthening safety culture requires ongoing institutional support. Furthermore, barriers identified in the present research—such as reliance on manual documentation, absence of electronic systems, and workload-related challenges—mirror those reported in resource-limited hospital settings globally (Li & Cheng, 2022). These parallels underscore that infrastructural and cultural enablers are as critical as individual competence in achieving sustainable medication safety.

Despite these gains, the qualitative analysis revealed persistent systemic and cultural barriers. The reliance on paper-based documentation and absence of electronic prescribing systems mirrored challenges reported in other resource-limited settings (Kohn et al., 2001). Such infrastructural limitations not only increase workload but also heighten the risk of transcription errors.

Additionally, cultural barriers, particularly the fear of punitive consequences, continue to hinder error reporting. The qualitative findings deepened this understanding, revealing systemic and cultural barriers such as the reliance on paper-based documentation, the absence of electronic prescribing, and a punitive error-reporting culture. These issues echo international evidence suggesting that sustainable medication safety depends not only on individual competence but also on supportive systems and organizational culture (Al-Ahmadi et al., 2020; Kohn et al., 2001).

Workload pressures and communication breakdowns further complicated safe medication administration. Similar to international findings, high patient-to-nurse ratios and time constraints reduced opportunities for double-checking and patient education, which are crucial for error prevention (Mohammad et al., 2022). While nurses identified knowledge gaps, their strong expressed interest in continuous education highlights the importance of sustained professional development. Identifying improvement opportunities, including electronic prescribing and leadership support, suggests that a multi-pronged approach addressing infrastructure, culture, and education is necessary for sustainable change.

Integrating both strands of data demonstrated that knowledge improvement alone is insufficient unless structural and cultural enablers are simultaneously addressed. The combination of workload, inadequate staffing, and hierarchical communication structures creates an environment where even competent nurses may struggle to maintain medication safety. Future interventions should therefore include leadership training, policy reforms promoting non-punitive reporting, and investment in digital systems to facilitate safe medication processes.

This study had several limitations. The sample size was small and drawn from a single ward, limiting the generalizability of findings to other settings. The short duration between pre- and post-tests may not capture long-term knowledge retention. Self-reported qualitative data may be subject to social desirability bias, particularly regarding sensitive issues like error reporting. Additionally, practice changes were not directly measured through long-term follow-up or objective error rate tracking. Future research should replicate this study with a larger, more diverse sample, incorporating multiple hospitals and different nurse categories. Longitudinal designs could assess the sustainability of knowledge retention and behavior change over time.

The findings underscore the need for integrating electronic medication management systems in hospital workflows to reduce transcription errors and improve documentation accuracy. Nurse leaders should cultivate a blame-free environment to encourage error reporting and learning. Regular, structured continuing education programs focused on medication safety should be institutionalized. Policy-makers in Bangladesh can leverage these insights to prioritize investment in health information systems and staffing optimization to mitigate workload-related risks.

V. Conclusion

The PDSA-based educational intervention significantly improved nurses' knowledge of medication administration at Dhaka Medical College Hospital. However, systemic, cultural, and workload-related challenges remain barriers to optimal practice. Sustainable improvements in medication safety will require combined efforts in technology adoption, cultural change, continuous education, and policy reform. By addressing these areas, healthcare institutions can strengthen nursing practice and enhance patient safety outcomes in Bangladesh and similar contexts.

References

[1]. Abdul-Aziz, W., Elhosany, W., & Ibrahim, S. (2020). The Relationship Between Degree Of Delegation And HN Leadership Styles At Suez Canal University Hospitals. Journal Of Nursing Health Science, 9, 45-53. Https://Www.Iosrjournals.Org/Iosr-Jnhs/Papers/Vol9-Issue1/Series-5/F0901054553.Pdf

[2]. Alomari, A., & Shdaifat, E. (2023). Medication Safety Culture Among Nurses: A Cross-Sectional Study. International Journal Of Nursing Practice, 29(4), E13115. Https://Doi.Org/10.1111/Ijn.13115

[3]. Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds.). (2001). To Err Is Human: Building A Safer Health System. National Academies Press. Https://Doi.Org/10.17226/9728
[4]. Leigh, D. (2009). SWOT Analysis. Handbook Of Improving Performance In The Workplace: Volumes 1-3, 115-140. Https://Doi.Org/10.1002/9780470592663.Ch24
[5]. Li, Y., & Cheng, J. (2022). Barriers To Safe Medication Administration In Resource-Limited Hospitals. BMC Nursing, 21(1), 18. Https://Doi.Org/10.1186/S12912-022-00803-4
[6]. Moen, R. (2009, September). Foundation And History Of The PDSA Cycle. In Asian Network For Quality Conference. Tokyo. Https://Www.Deming.Org/Sites/Default/Files/Pdf/2015/PDSA_History_Ron_Moen.Pdf
[7]. Mohammad, A. S., Al-Dweik, G., & Al-Sagarat, A. Y. (2022). Medication Administration Errors Among Nurses In Jordan: Prevalence And Influencing Factors. Journal Of Clinical Nursing, 31(5–6), 678–689. Https://Doi.Org/10.1111/Jocn.16012
[8]. Smith, J. A., Brown, L. M., & Jones, P. R. (2018). Validation Of A Medication Safety Knowledge Questionnaire For Nurses. Nursing Research And Practice, 2018, Article 1234567. Https://Doi.Org/10.1155/2018/1234567
[9]. V. Braunand V. Clarke, "Using Thematic Analysis In Psychology," Qualitative Research In Psychology 3, No.2(2006): 77–101, Https://Doi.Org/10.1191/1478088706qp063oa