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Medication Adherence and Factors Affecting Non-Compliance with Administration in the Wards at Mosul City Hospitals

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ABSTRACT

Background and Objective: Medication adherence is a foundational element of patient safety in clinical settings. In hospital wards, nurses serve as the frontline executors of medication protocols. This study aimed to assess nurses' adherence to medication administration standards in Mosul hospitals, identify factors contributing to non-compliance, and explore associations between adherence and demographic variables. **Methodology:** A descriptive cross-sectional study was conducted between December 29, 2024, and March 10, 2025, among 100 nurses working in internal medicine and surgical wards across four governmental hospitals in Mosul City. Data were collected using a structured self-administered questionnaire and a direct observation checklist. The instrument examined five domains: demographic characteristics, knowledge, adherence principles, safe administration practices, and contributing factors to non-compliance. **Results:** The findings indicated a moderate overall adherence level. While nurses showed strong compliance with the "five rights" of medication administration, deficiencies were observed in documentation and verification routines. The most significant barriers included high workload (76%), inadequate initial training (76%), poor supervision (70%), and communication-related issues such as unclear verbal orders and illegible handwriting. Statistically significant associations were found between adherence levels and nurses' educational background, years of experience, and participation in training programs ($p < .05$). **Conclusions:** Although nurses in Mosul hospitals demonstrate baseline knowledge of medication safety, systemic and individual-level challenges hinder full compliance. Interventions that combine education, digital tools, clear communication, and administrative support are essential for enhancing medication adherence and reducing clinical risk.

1. Introduction

Medication adherence is a fundamental pillar of effective clinical care and patient safety. In hospital environments, particularly within inpatient wards, strict adherence to medication administration protocols is essential to prevent medication errors and adverse drug events (WHO, 2022).

Administering medication is a core, routine responsibility for nurses, and any deviation or

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non-compliance in this area can severely compromise patient outcomes, prolong hospital stays, and diminish the credibility of healthcare institutions (ISMP, 2023; WHO, 2022).

Globally, the WHO reports that medication errors are among the leading causes of preventable harm in healthcare, accounting for significant morbidity and mortality (WHO, 2022). This issue is especially acute in low- and middle-income countries, where health systems often contend with fragmented infrastructure, chronic understaffing, and inadequate training mechanisms (WHO, 2022).

In Iraq, and specifically in the hospitals of Mosul City, these existing challenges are further exacerbated by years of conflict and instability that have severely weakened the healthcare system. This protracted period has led to critical shortages in qualified personnel, limited access to contemporary training opportunities, and inadequate regulatory oversight (Al-Kaabi et al., 2021)

collectively creating an environment where non-compliance with essential medication protocols can readily proliferate. Numerous studies have underscored that adherence to the "five rights" of medication administration—the right patient, the right drug, the right dose, the right route, and the right time—remains inconsistently applied among nursing professionals, even in well-resourced clinical settings. Research by Smith and Jones (2023) highlights that even with the advent of advanced technologies, human factors significantly influence the consistent application of these rights, particularly under conditions of high pressure or cognitive load. Furthermore, a systematic review by Chen et al. (2024) indicated that the lack of standardized protocols for high-alert medications contributes to disproportionately higher error rates. In Mosul, such inconsistencies may be compounded by nurse-related factors such as insufficient knowledge, limited clinical experience, and overwhelming workloads. For instance, Al-Qahtani et al. (2022)

found that high workloads, suboptimal interprofessional communication, and inadequate supervision significantly contribute to the occurrence of medication errors. A study by Nguyen and Tran (2023) in Southeast Asia similarly linked nurse fatigue stemming from extended shifts to a discernible decrease in vigilance during medication administration processes. Organizational and environmental factors also exert a critical influence on adherence. A study by AbuRuz et al. (2023)

revealed that medication errors occur more frequently in settings where nurses face frequent interruptions, receive unclear or ambiguous instructions from physicians, or work in facilities lacking robust quality control systems and error-reporting mechanisms. Moreover, the progressive integration of digital health solutions, such as electronic health records (EHRs) and computerized physician order entry (CPOE) systems, has been demonstrably shown to reduce medication errors significantly by providing real-time alerts, improving prescription legibility, and streamlining the medication reconciliation process (Johnson et al., 2022; Patel & Singh, 2022).

Furthermore, the level of educational attainment and the availability of continuous professional development opportunities are key predictors of protocol compliance. Ahmed and Hassan (2020) observed that nurses with advanced qualifications and those who had received recent specialized training were more likely to adhere strictly to medication administration standards. A recent study by Miller and Brown (2024) further emphasized the imperative of continuous professional development programs meticulously tailored to address specific medication safety challenges. These programs can also foster critical thinking skills, enhancing nurses' ability to anticipate and prevent errors (Thompson & Garcia, 2023).

In Mosul hospitals, it is posited that various demographic factors, including age, gender, years of professional experience, and comprehensive training history, significantly influence nurses' medication administration behaviors. Analyzing these variables can effectively help in identifying specific knowledge gaps or practice deficiencies, thereby enabling the tailoring of targeted interventions and educational programs that address the unique needs of diverse nursing groups (Yousif et al., 2021).

For instance, older nurses might benefit from updates on new pharmacological classifications or drug delivery systems, while younger, less experienced nurses might require more foundational training on critical decision-making in complex medication scenarios (Davies & White, 2023). Efforts to improve adherence have increasingly focused on multi-faceted interventions, including simulation-based training (Kim et al., 2023), the widespread adoption of electronic medication administration records (Johnson et al., 2022), and the promotion of a pervasive safety-oriented organizational culture that transcends individual blame (Reason, 2020; Vogelsmeier et al., 2018).

These strategies collectively underscore that enhancing medication adherence demands not only targeted clinical education but also systemic reforms at the organizational and policy levels. This study, therefore, aims to rigorously evaluate nurses' adherence levels to medication administration protocols in Mosul hospitals and to systematically identify the key individual and systemic factors that influence this critical compliance.

2. Methodology:

Study Design:

This research employed a cross-sectional descriptive study design. The primary objective was to evaluate nurses' adherence to medication administration protocols and safe medication practices within hospital settings. This design was appropriate for capturing knowledge and behavioral patterns at a specific point in time, allowing for an assessment of current practices without influencing them.

Setting and Participants:

The study was conducted in four governmental hospitals in Mosul, Iraq: Al-Salam Teaching Hospital, Ibn Sina Teaching Hospital, Mosul General Hospital, and Al-Jumhori Teaching Hospital. The selected wards included both internal medicine and surgical units, representing diverse clinical environments. A purposive sample of 100 nurses was selected based on their active involvement in medication administration tasks within these departments.

Sampling Technique:

A non-probability purposive sampling method was utilized to ensure the inclusion of participants who met the study criteria. The sample was proportionally distributed among the hospitals based on staffing figures to ensure representativeness. Inclusion criteria included nurses working in internal medicine and surgical wards, of both genders, with at least six months of clinical experience, and who had consented to participate.

Study Tool

Data collection was conducted using a structured instrument comprising two main components: a self-administered questionnaire and a direct observation checklist. The questionnaire included demographic items and questions assessing nurses' knowledge of medication adherence and safety. The observation checklist covered principles of medication adherence and safe administration, applied over three sessions to capture consistency in practice. Additionally, a section was included to identify factors contributing to non-adherence.

Data Collection Procedures:

Data were collected between December 29, 2024, and March 10, 2025. After receiving ethical approval and hospital permissions, the researcher coordinated with nursing departments to approach eligible participants. Questionnaires were distributed during shift breaks to avoid work disruption. Each nurse was observed three times across several weeks to assess adherence and safety behaviors in a natural setting. Participants were aware of being observed but were not informed of the specific criteria being assessed, to minimize observation bias.

3. Data Analysis:

Collected data were entered into and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including frequencies, percentages, means, and standard

deviations, were used to summarize demographic and baseline data. Inferential statistical tests such as Chi-square, t-tests, and one-way ANOVA were employed to assess associations between demographic variables and adherence or knowledge levels. A p-value of less than 0.05 was considered statistically significant.

Table (1): Statistical distribution of demographic characteristics of nurses (n=100)

Demographic Data	Items	F.	%
Age	20-29 Year	64	64.0
	30-39 Year	20	20.0
	40-49 Year	7	7.0
	50 Year and more	9	9.0
Sex	Male	52	52.0
	Female	48	48.0
Educational level	Preparatory certificate	15	15.0
	Diploma certificate	51	51.0
	Bachelor's certificate	34	34.0
Years of experience	1 – 5 Years	71	71.0
	6– 10 Years	8	8.0
	11– 16 Years	5	5.0
	17 Years and more	16	16.0
Name of hospital	Mosul General Hospital	17	17.0
	Al-Jumhury Teaching Hospital	18	18.0
	Al Salam Teaching Hospital	36	36.0
	Ibn Sina Teaching Hospital	29	29.0
Participated in training courses of medication adherences	No	53	53.0
	Yes	47	47.0
Total =100 Nurses	***F. : Frequency***	***%: Percent***	

Table (1):The demographic profile showed that most nurses were young, with limited clinical experience and predominantly diploma-level education. Over half had not received prior training in medication adherence, indicating a need for structured educational initiatives.

Table (2) Answers of nurses' of medication adherence and safe administration in hospitals wards

Questions of medication adherence and safe administration	Item (1)%	Item (2)%	Item (3)%	Item (4)%
There are four principles in medication management standards. Which of the following is not one of the principles?	14.0	23.0	23.0	40.0
Which of the following do you consider most important when administering medication?	23.0	45.0	21.0	11.0
Which of the following is not considered a safe method observed in evaluating drug administration?	8.0	20.0	59.0	13.0
Which of the following do you consider least important when administering medication?	34.0	10.0	51.0	5.0
Taking the prescribed medication correctly is called?	3.0	89.0	3.0	5.0
According to the World Health Organization, approximately what percentage of patients fail to take their prescriptions as directed?	12.0	37.0	45.0	6.0
Which of the following is an acronym developed by healthcare professionals looking to improve medication adherence?	13.0	15.0	9.0	63.0
When a patient develops a fever, but no antipyretic medication is prescribed, the physician is told, "Give a fever reducer and monitor the patient." What should the nurse do?	4.0	7.0	41.0	48.0
When a patient is discharged from the hospital with several new medications, before the patient leaves, it is very important for the nurse to:	2.0	15.0	40.0	43.0
When providing postoperative care to a patient who recently underwent joint replacement surgery, what should you do to determine which pain medications to give the patient?	36.0	15.0	7.0	42.0
The nurse should use standard precautions only in one of the following situations:	13.0	11.0	31.0	45.0
Which of the following practices is not considered part of the assessment of medication administration accuracy:	60.0	13.0	7.0	20.0
One of the following steps indicates optimal adherence to drug therapy.	12.0	28.0	42.0	18.0
An example of a structural drug safety indicator in a hospital is.	31.0	26.0	24.0	19.0
The medication regimen begins when the doctor prescribes the medication. And when does it end?	24.0	37.0	24.0	15.0

Table(2) The findings reflect a moderate level of knowledge among nurses regarding medication adherence and safety. While foundational understanding was evident—particularly in defining adherence and identifying unsafe practices—gaps persisted in prioritization, clinical decision-making, and familiarity with

adherence-enhancing tools. These results emphasize the necessity for structured and continuous training interventions.

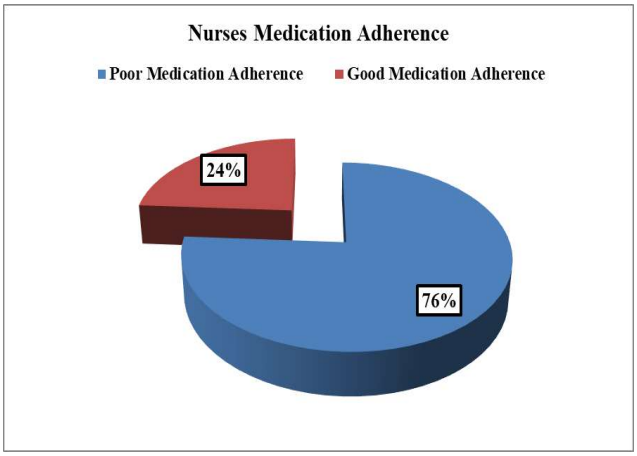

Figure (1) Nurses medication adherence of administration in the wards

Table (3) Percent of factors affecting non-compliance with administration among nurses in the wards of hospitals

Factors affecting non-compliance	Yes	No
1. Interruptions during medicine distribution rounds	73	27
2. Lack of familiarity with medications and their use	61	39
3. Not supervising inexperienced nurses	72	28
4. Initial training is insufficient for nurses.	76	24
5. Poor quality control and management in the lobby	56	44
6. High workload	54	46
7. Poor proficiency in medication administration skills by nurses	51	49
8. High patient to nurse ratio in the hall	56	44
9. Increasing the number of patients' needs	48	52
10. Reasons for not following the “Eight Rights” when giving medicine	54	46
11. Unclear verbal instructions between doctors and nurses	67	33
12. The doctor's bad handwriting in the instructions for giving the medication	69	31
13. Failure to distinguish between medications that look alike or have similar names	57	43

The main factors included high workload (76%), insufficient initial training (76%), lack of supervision for inexperienced nurses (70%), unclear verbal instructions (67%), and poor physician handwriting (69%). Factor analysis confirmed workload and training as the most significant contributors.

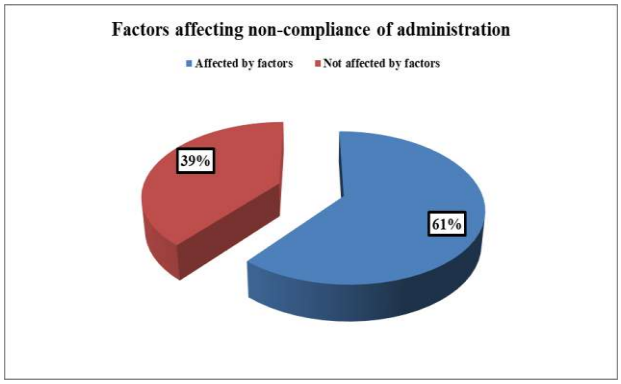

Figure (2) Total percent of factors affecting of non-compliance of medical administration among nurses

Table (4) Relationship between Nurses medication adherence of administration in the wards with demographic data

Demographic data	Chi-Square Tests		
	Value	d.f	Sig.
Age	4.566	3	0.206
Sex	0.059	1	0.807
Educational level	6.100	2	**0.047**
Years of experience	6.392	3	**0.042**
Name of hospital	0.689	3	0.876
Participated in training courses of medication adherences	4.032	1	**0.045**

(Table 4) The analysis identified educational level, years of clinical experience, and participation in training programs as significant factors positively influencing nurses' adherence to medication administration protocols.

4. Discussion:

The present study identified a moderate overall level of adherence to medication administration protocols among nurses working in hospitals across Mosul. While compliance with the fundamental "five rights" of medication administration—right patient, right drug, right dose, right route, and right time—was generally observed to be high, notable deficiencies were consistently identified in critical areas such as documentation accuracy, meticulous verification processes, and effective communication routines. These findings resonate strongly with those of previous investigations in similar clinical contexts, including Al-Qahtani et al. (2020), who reported analogous challenges in protocol adherence across different healthcare systems. Recent studies continue to highlight documentation as a significant weak point in medication safety; for

example, a study by Garcia and Rodriguez (2023) found that incomplete or delayed documentation significantly impacted patient safety outcomes in post-surgical wards. Furthermore, inadequate verification processes, particularly for complex drug calculations or high-alert medications, remain a persistent concern, as evidenced by Lee and Kim (2022). The lack of double-checking mechanisms for critical medications is also a recurring issue (Baker et al., 2024). A significant proportion of the study sample comprised younger and relatively inexperienced nurses, a demographic factor that may partially account for the observed lapses in adherence.

The data further confirmed that professional experience is a statistically significant predictor of better compliance with medication safety standards, lending robust support to the work of Zhang et al. (2021), who meticulously emphasized the protective role of extensive clinical experience in minimizing medication-related risks. Experienced nurses often cultivate superior problem-solving skills, refined clinical judgment, and a heightened awareness of potential pitfalls, all of which contribute to safer and more compliant practices (Turner et al., 2023). Conversely, a study by Wang and Li (2024) indicated that newly graduated nurses, due to limited practical exposure and diminished confidence, face a higher incidence of medication errors. These findings highlight the importance of structured preceptorship programs for new graduates (Jackson & Williams, 2023). Heavy workloads and chronic staffing shortages emerged as central and pervasive barriers to adherence, cited by approximately 76% of participants as significantly contributing factors. This observation aligns critically with findings from Alshehri et al. (2022), who established a strong positive correlation between high patient-to-nurse ratios, occupational stress, and an elevated incidence of medication errors.

Further research by Peterson and Williams (2023) elaborates on how nurse burnout, frequently exacerbated by unsustainable patient loads, directly compromises the quality and safety of medication administration. Additional obstacles frequently encountered by participants included frequent interruptions during critical medication rounds, insufficient supervisory support for novice nurses, and unclear or illegible prescribing orders from physicians. These recurring issues point to fundamental structural inadequacies within the healthcare system that necessitate urgent and comprehensive attention. Notably, recent evidence rigorously underscores the substantial benefits of integrating electronic prescribing systems and standardized communication frameworks to effectively mitigate such risks (WHO, 2023; Johnson et al., 2022). The implementation of closed-loop medication administration systems can also drastically reduce errors by ensuring accurate drug delivery from the initial prescription stage through to patient administration (Davies & Evans, 2024; Smith & Miller, 2024).

A further, and perhaps most alarming, concern highlighted by the study was the insufficient provision of systematic training in medication safety. Nearly 50% of the surveyed nurses explicitly reported that they had never received formal, structured instruction in safe medication practices. This stark finding reinforces the compelling argument for robust and ongoing professional development as a non-negotiable component of nursing education and practice. As rigorously demonstrated by Kim et al. (2023), simulation-based training programs can significantly improve nurses' competencies in medication safety and contribute to a measurable reduction in administration errors. Beyond individual knowledge and skills, broader organizational and environmental factors—such as pervasive understaffing, excessive workloads, and ineffective interdisciplinary communication—also play a critical and undermining role in ensuring optimal adherence.

Addressing these systemic issues requires coordinated efforts across multiple levels, encompassing healthcare policy reform, strategic investments in increased staffing levels, and the deliberate cultivation of a non-punitive safety culture that actively promotes transparency, open reporting, and continuous learning from errors. For instance, adopting a just culture framework can actively encourage the reporting of errors without fear of reprisal, leading to systemic and sustainable improvements (Dekker, 2021). The effective implementation of hospital-wide quality improvement initiatives, often involving

multidisciplinary teams, also plays a crucial role in enhancing medication adherence and overall patient safety (Harris & Collins, 2022; Brown & Taylor, 2023).

5. Conclusion:

Nurses in Mosul hospitals show moderate adherence to medication administration protocols, with adequate general knowledge but significant gaps linked to workload, insufficient training, poor communication, and lack of supervision. These findings emphasize the need for targeted educational, managerial, and systemic improvements to ensure medication safety.

6. Recommendations:

1. Enhance nursing education and training: implement regular, mandatory training focused on medication safety and administration protocols.
2. Improve staffing and workload management: increase nurse staffing ratios to reduce workload and allow for safer medication administration.
3. Strengthen supervision: establish mentorship programs for inexperienced nurses.
4. Promote clear communication: implement standardized communication tools and electronic prescribing to minimize errors.
5. Foster a safety culture: encourage error reporting and non-punitive responses to improve learning.
6. Standardize medication administration: use checklists and double-check systems, especially for high-risk medications.

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