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Research Article

Physician Adherence to Treatment Guidelines and the Incidence of Prescribing Errors for Patients in Intensive and Cardiac Care Units at a Teaching Hospital, Al-Muthanna City, Iraq: A Retrospective Analysis

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Abstract

Background: Prescribing errors are common worldwide. They are exposing critically ill patients to increased morbidity and mortality and overwhelming healthcare systems. Limited data exist on the prevalence of prescribing errors for critically ill patients in Iraq. ***Objectives***: To assess the prevalence and types of prescribing errors in the Cardiac and Intensive Care Units in Iraq. ***Methods***: A retrospective study was conducted at a teaching hospital in Al-Muthanna, Iraq. Charts of patients admitted to the Cardiac and Intensive Care Units for at least one day between January and June 2024 were included, excluding those without a diagnosis. To detect prescribing errors, the latest American guidelines, the British National Formulary, and Medscape were used. ***Results***: Out of 239 charts included, 107 showed prescribing errors. Patients were prescribed 7.66±2.32 medications. Meanwhile, 2.29±1.17 of them contain an error. Omission of indicated medications (81.3%) and dosing errors (43%) were detected due to non-adherence to treatment guidelines. Lack of monitoring for prescribed medications (59.8%) and prescribing drug-drug interactions (31.8%) were also common. The number of diseases and renal impairments were positively correlated with frequency of errors. Patient age, medical history, renal function, number of medications, and errors didn't significantly impact patients' mortality. ***Conclusions***: Prescribing errors are prevalent in the cardiac ICU, mainly due to poor adherence to treatment guidelines. Despite the presence of errors, no significant relationship was reported between prescribing errors and patients' mortality.

Keywords: Cardiac care unit; Critical care unit; Intensive care unit; Iraqi hospitals; Prescribing errors.

التزام الطبيب بإرشادات العلاج وحدوث أخطاء في وصف الأدوية للمرضى في وحدات العناية المركزة والعناية القلبية في مستشفى تعليمي بمدينة المثنى، العراق: تحليل استعادي

الخلاصة

الخلفية: أخطاء الوصف شائعة في جميع أنحاء العالم، وتعرض المرضى في الحالات حرجة لزيادة المراضة والوفيات وأنظمة الرعاية الصحية المرهقة. توجد بيانات محدودة حول انتشار أخطاء الوصف للمرضى في الحالات الحرجة في العراق. **الأهداف**: تقييم انتشار وأنواع أخطاء وصف الدواء في وحدات القلب والعناية المركزة في العراق. **الطرائق**: أجريت دراسة بأثر رجعي في مستشفى تعليمي في المثنى، العراق. تم تضمين سجلات المرضى الذين تم إدخالهم إلى وحدات القلب والعناية المركزة لمدة يوم واحد على الأقل بين يناير ويونيو 2024، باستثناء من لم يتم تشخيصهم. لاكتشاف أخطاء الوصف، تم استخدام أحدث الإرشادات الأمريكية، وهي الوصفة الوطنية البريطانية، وMedscape. **النتائج**: من بين 239 سجلا تم تضمينها، أظهرت 107 أخطاء في وصف الأدوية. تم وصف 7.66±2.32 دواء للمرضى. في الوقت نفسه، يحتوي 2.29±1.17 منها على خطأ. تم اكتشاف حذف الأدوية الموصى بها (81.3٪) وأخطاء في الجرعات (43٪) بسبب عدم الالتزام بإرشادات العلاج. كما كان نقص المراقبة للأدوية الموصوفة (59.8٪) ووصف تداخلات الأدوية (31.8٪) شائعا أيضا. كان عدد الأمراض والاضطرابات الكلوية مرتبطا إيجابيا بتكرار الأخطاء. عمر المريض، التاريخ الطبي، وظائف الكلى، عدد الأدوية، والأخطاء لم تؤثر بشكل كبير على وفيات المرضى. **الأستنتاجات**: أخطاء الوصف الطبي شائعة في وحدة العناية المركزة القلبية، ويرجع ذلك أساسا إلى ضعف الالتزام بإرشادات العلاج. على الرغم من وجود الأخطاء، لم يتم الإبلاغ عن علاقة ذات دلالة إحصائية بين أخطاء الوصف ووفيات المرضى.

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INTRODUCTION

Medication errors are a widespread issue globally [1]; meanwhile, they are generally preventable and may result from deficiencies in healthcare professional competence or practice, as well as systemic issues within the healthcare system [2]. They encompass various types, including prescribing, dispensing, and administration errors; however, prescribing errors are the most prevalent among them [2]. Medication errors in critically sick patients are a major concern because they can have a negative impact on patient outcomes (increase morbidity and mortality) [3,4] and healthcare expenditures [5]. Patients in critical care units, including intensive and cardiac care units [6], are particularly vulnerable to medication-related incidents due to multiple factors. These patients often present with organ failures, particularly of the liver and kidneys. The severity of their illnesses often leads to prolonged stays in hospital. Medication-related risks are enhanced by the prescription of multiple medications; most of these were administered intravenously and required precise calculation of infusion rates. Additionally, systemic challenges such as long-term shortages of trained healthcare professionals—including doctors, nurses, and

pharmacists—results in high workloads, fatigue, and limited time for essential tasks like patient counselling, prescription verification, and dispensing checks [7-9]. Furthermore, non-adherence to evidence-based guidelines increases the chance of medication errors, especially prescribing errors; meanwhile, such deviations from established protocols are common, often driven by workload pressures, insufficient training, or systemic issues [10,11]. Studies from developed and developing countries highlight that prescribing errors represent a significant type of medication error in critical care units, with some reports indicating that about 70% of medication errors are prescribing-related, many of which can lead to severe and life-threatening complications that necessitate additional treatment [12, 13]. Currently, there is limited data on adherence to treatment guidelines and the prevalence of prescribing errors in Iraqi hospitals' critical care settings [14]. To address this gap, this study aims to retrospectively analyze medical records from a teaching hospital in Al-Muthanna City, Iraq. The primary objectives are to assess how well physicians adhere to established treatment guidelines and to identify the frequency and types of prescribing errors (PE) among patients admitted to the cardiac and intensive care units (CICU). The findings of this study are intended to inform policymakers, with the ultimate goal of improving medication safety and enhancing patient outcomes within Iraqi critical care environments.

METHODS

Study design, setting, and sample

A cohort retrospective study was conducted from 01/02/2025 to 01/07/2025 at the CICU of Al Husain Teaching Hospital in Al-Muthanna City, Iraq, to determine prescribing errors. All charts for adult patients who have been admitted to the CICU at least one day were included in this retrospective cohort study. However, this study excluded charts for children, adolescents, pregnant women, and those lacking a clear case diagnosis. All eligible charts for patients admitted to the CICU of Al-Husain Teaching Hospital from January to June 2024 were included in this study.

Data collection

A specially designed checklist was developed by study authors and then validated by a panel of five experts (3 academic clinical pharmacists and 2 internists who have working experience in the CICU). The checklist was designed to collect comprehensive data, including patient demographics (age, gender, and smoking status), clinical information (past medical history, medication history, vital signs, renal and liver function, and drug allergies), as well as details such as the reason for admission to the CICU (diagnosis of the patient's case), information about the primary care physician (age and gender), the number of physicians involved in the patient's care, patient outcomes (died, discharged with improvement, or transferred to another ward), and a list of potential prescribing errors. Renal function was determined based on information documented in the patient chart; patients on dialysis were classified as having renal failure (RF). If details were not available, the estimated glomerular filtration rate (GFR) was calculated using standardized equations. Individuals exhibiting a GFR below 60 mL/min were diagnosed with chronic kidney disease (CKD), whereas those with a GFR under 15 mL/min were identified as having renal failure. For statistical analysis, patients without CKD or RF were considered to have normal kidney function and were assigned a score of 1. Patients with CKD were assigned a score of 2, and those with RF were assigned a score of 3. The age of physicians involved in the patient's care was determined by checking with the physician himself/herself. The review involved examining the signatures of all physicians, including those on rotation, who provided care to the patient during both morning and night shifts. Since American guidelines were the most commonly followed guidelines among Iraqi physicians [15], the prescribed treatments for patients in the CICU were evaluated in accordance with the latest American guidelines applicable during the study period. The principal author, a PhD candidate in clinical pharmacy, thoroughly reviewed the medical charts of patients admitted to the CICU. For each patient, prescribed medications—including doses, dosage forms, frequencies, and durations—were compared to the standard treatment recommendations tailored to the patient's condition (diagnosed case in the CICU) to assess physician adherence to the treatment guidelines. Any deviation from the established treatment guidelines—including the omission of indicated medications, prescription of non-indicated medications, prescription of medications for inappropriate indications, or inaccuracies in dose, frequency, dosage form, or duration of therapy—was considered as poor adherence to the guidelines. Additionally, the researcher assessed the accuracy of the prescribed medications from a pharmaceutical perspective, based on the information in the latest edition of the British National Formulary (BNF) [16] and Medscape (website or mobile application). In this context, prescribing a medication that is contraindicated, has potential interactions, poses an allergy risk to the patient, or whose efficacy and safety are not monitored was considered a prescribing error. Furthermore, prescribing two medications from the same pharmaceutical class was also classified as a prescribing error.

Ethical approval and consent

The study was ethically approved by the Ethical Committee of the College of Pharmacy—University of Baghdad (Certificate ID: RECA4BCP16102024R) in accordance with the ethical standards for the International Ethical Guidelines for Health-Related Research Involving Humans (CIOM/WHO) and the principles outlined in the Belmont Report. The need for participant consent was waived by the Ethical Committee due to the retrospective design of the study, no potential risks to participants, and difficulties in obtaining patients' consent. Meanwhile, the identity of the research participants was withheld during and after data collection as well.

Statistical analysis

Data input and analysis were performed using SPSS version 16. Categorical variables were summarized as frequencies and percentages, while continuous variables were presented as mean ± standard deviation. The Shapiro-Wilk test was employed to assess the normality of data distribution. The test for two-group comparison was done by using the Mann-Whitney U test for abnormally distributed data and the independent t-test for normally distributed data. The chi-square test was used to evaluate differences among categorical variables. Pearson correlation analysis was conducted for normally distributed continuous variables, whereas Spearman's rho correlation was used for variables that were not normally distributed. A binary logistic regression was used to analyze the impact of different factors on the mortality rate of patients admitted to the CICU. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

The total number of charts investigated for the included study period was 8261; however, only 711 patients were admitted to the CICU (586 in the Cardiac Care Unit (CCU) and 125 in the Intensive Care Unit (ICU)). After applying the exclusion criteria, only 239 patient cases were included in this study (192 in the CCU and 47 in the ICU) (Figure 1). Regarding the charts included, prescribing errors were detected in 85 of the CCU charts (44.27%) and in 22 of the ICU charts (46.81%). For the included charts with prescribing errors, the mean age of patients admitted to the CICU was 61.22±12.58 years (60±12.88 years for patients admitted to the CCU and 65.95±10.28 years for patients admitted to the ICU). Most patients (>50%) were non-smoking males with negative surgical histories. The majority of patients (70.6%) who were admitted to the CCU were suffering from acute coronary syndrome (ST segment elevation myocardial infarction (STEMI), non-ST segment elevation myocardial infarction (NSTEMI), and unstable angina).

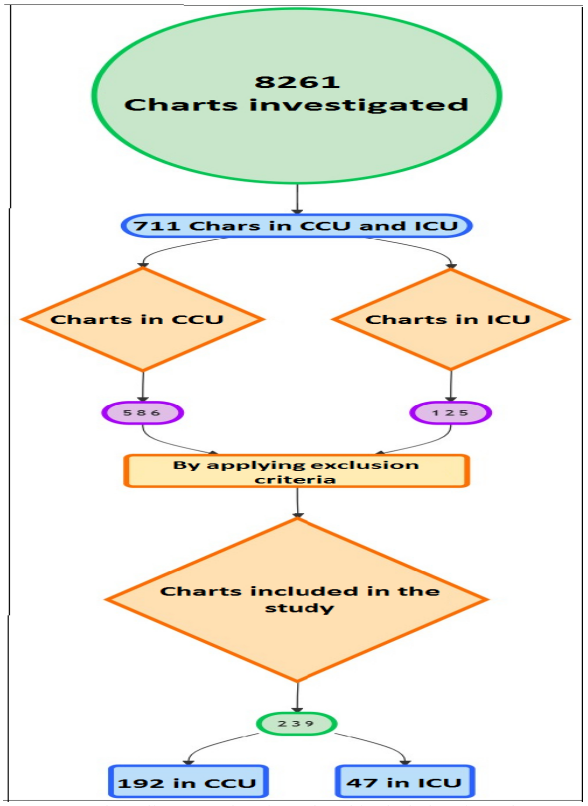

Figure 1: Flow diagram of reviewed and included patient charts.

Chronic kidney disease (CKD) was the most common reason (31.8%) for admission to the ICU. Further details about patient demographics and clinical characteristics for the included cases are shown in Table 1.

Table 1: Patient Demographics and clinical characteristics for the cases included

Parameter		CICU patients (n=107)	CCU patients (n=85)	ICU patients (n=22)
Age (year)		61.22±12.58	60.00±12.88	65.95±10.28
Gender	Male	65 (60.7)	51 (60.0)	14 (63.6)
	Female	42(39.2)	34(40.0)	8(36.3)
Smoking status	Current smoker	50(46.7)	39(45.9)	11(50.0)
	X-smoker	17(15.9)	14(16.4)	3(13.6)
	Non-smoker	40(37.4)	32(37.6)	8(36.3)
Surgical history	Positive	17(15.9)	12((14.1)	5(22.7)
	Negative	90(84.1)	73(85.8)	17(77.2)
Medical history	One disease	22(20.5)	22(25.9)	0(0.0)
	Two diseases	29(27.1)	21(24.7)	8(36.3)
	Three diseases or more	37(34.6)	25(29.4)	12(54.5)
	Negative history	19(17.7)	17(20.0)	2(9.1)
Main reason for admission	STEMI	19(17.7)	19(22.3)	0(0.0)
	NSTEMI	17(15.9)	17(20.0)	0(0.0)
	UA	24(22.4)	24(28.2)	0(0.0)
	DHF (both DHF and HF)	17(15.9)	17(20.0)	0(0.0)
	Ischemic stroke	4(3.7)	0(0.0)	4(18.2)
	CKD	7(6.5)	0(0.0)	7(31,8)
	AF	5(4.7)	5(5.9)	0(0.0)
	Endocarditis	3(2.8)	3(3.5)	0(0.0)
	VTE	2(2)	0(0.0)	2(9.1)
	Pneumonia	3(2.8)	0(0.0)	3(13.6)
	abdominal aortic aneurysm dilatation	1(1)	0(0.0)	1(4.5)
	Diabetic foot	1(1)	0(0.0)	1(4.5)
	Subarachnoid hemorrhage	1(1)	0(0.0)	1(4.5)
	Meningitis	1(1)	0(0.0)	1(4.5)

Values are presented as frequency, percentage and mean±SD.

The average number of medications prescribed to patients admitted to the CICU was 7.66 ± 2.32. Meanwhile, patients admitted to the ICU received an average of 8.64 ± 3.00 medications, which was slightly higher than, but not significantly different from, the average number of medications prescribed to patients admitted to the CCU (7.41 ± 2.06) (Table 2). Regarding prescribing errors (Table 2), patients admitted to the CICU received an average of 2.29 ± 1.17 medications with errors. In the ICU, the average was slightly higher at 2.64 ± 1.43 medications, compared to 2.20 ± 1.09 in the CCU; however, this difference was not statistically significant (p= 0.264). Meanwhile, the average number of prescribing errors per patient was 4.36±1.57 for those admitted to the CICU. In the ICU, the average was slightly higher at 4.86±1.91 errors, compared to 4.22±1.46 in the CCU; however, this difference was not statistically significant (p=0.132).

Table 2: The number of prescribed medications and prescribing errors for patients admitted to the CCU and the ICU

Parameter	CICU (n=107)	CCU (n=85)	ICU (n=22)	*p*-value*
Number of prescribed medications for each patient	7.66±2.32	7.41±2.06	8.64±3.00	0.059
Number of prescribed medications with errors to each patient	2.29±1. 17	2.20±1.09	2.64±1.43	0.264
Total number of medication errors per patient	4.36±1.57	4.22±1.46	4.86±1.91	0. 132

Values are presented as mean±SD. *Statistical tests were done using Man-Whitney U test.

According to the treatment guidelines, the most frequently observed error was the omission of an indicated medication, identified in 87 charts (81.3%) of patients admitted to the CICU. Although the omission rate was higher among CCU patients (83.5%) compared to ICU patients (72.7%), this difference was not statistically significant (p= 0.247). Dosing and frequency errors were also prevalent, identified in 43% and 40% of charts for patients admitted to the CICU, respectively. Other types of error, such as incorrect duration of medication use and prescribing non-indicated medication, were less common and detected in 2% and 1% of charts, respectively. Conversely, prescribing medications with inappropriate indications or in incorrect dosage forms was not observed in any of the included charts. More data are found in Table 3.

Table 3: Physicians' non-adherence to treatment guideline

Parameter	CICU (n=107)	CCU (n=85)	ICU (n=22)	*p*-value*
Dosing error n(%)	46(43)	35(41.2)	11(50)	0.456
Incorrect frequency n(%)	43(40)	35(41.2)	8(36.4)	0.797
Incorrect dosage form	0(0.0)	0(0.0)	0(0.0)	1.00
Inappropriate indication	0(0.0)	0(0.0)	0(0.0)	1.00
Incorrect duration of use	2.0(2.0)	2(2.4)	0(0.0)	1.00
Omission of an indicated medication	87(81.3)	71(83.5)	16(72.7)	0.247
Prescribing a non-indicated medication	1.0(1.0)	1.0(1.2)	0(0.0)	1.00

Values are presented as frequency and percentage. All numbers refer to the number of charts with errors; *Fisher exact test and chi square test.

Regarding pharmaceutical errors, the most frequently observed error was the lack of monitoring for medications that need monitoring, identified in 64 charts (59.8%) of patients admitted to the CICU. This issue was significantly more prevalent among patients admitted to the ICU compared to those in the CCU (81.8% vs. 54.1%; p= 0.018). The second most common error was interaction between the prescribed treatment, which was identified in 34 charts (31.8%) for patients admitted to the CICU; such a problem was not significantly different between ICU and CCU. Errors in administration instructions were detected in 7 charts (6.5%) of patients admitted to the CICU (6 in CCU and 1 in ICU). Other errors, such as prescribing two medications from the same pharmaceutical group and prescribing contraindicated medications, were identified in only one chart for a patient who was admitted to the CCU. No physicians prescribed a medication to any patient with a documented known allergy to that medication. More details are found in Table 4.

Table 4: Pharmaceutical errors in charts for patients admitted to the CICU

Parameter	CICU (n=107)	CCU (n=85)	ICU (n=22)	*p*- value
D-D interaction	34(31.8)	26(30.6)	8(36.4)	0.604*
Prescribing contra-indicated medications	1.0(0.9)	1(1.2)	0(0.0)	1.0**
Prescribing a medication to a patient with known allergy	0(0.0)	0(0.0)	0(0.0)	1.0**
Duplicate prescribing (prescribing two medications of same type)	1(0.9)	1.0(1.2)	0(0.0)	1.0**
Lack of indicated monitoring	64(59.8)	46(54.1)	18(81.8)	0.018*
Other (error in administration instructions)	7(6.5)	6(7.1)	1(4.5)	1.0**

Values are expressed as frequency and percentage. *Chi square test;**Fisher exact test.

Table 5 indicates that only the number of diseases in the patient's medical history and the presence of renal impairment were positively and significantly correlated with the frequency of prescribing errors. In contrast, factors such as length of stay in the CICU, patient age, admission ward, and the number of prescribed medications showed no significant association with prescribing error frequency. Binary regression analysis revealed that none of the factors (including patient age, medical history, presence of renal impairment, number of prescribed medications, number of prescribing errors, and admission ward) had a significant effect on the mortality rate of patients admitted to the CICU (Table 6).

Table 5: Impact of various factors on the frequency of prescribing errors

Parameter	Correlation coefficient	*p*-value
Days in CICU	0.177	0.067
Age of patient	0.139	0.153
Age of the main caring physician	0.020	0.837
No of diseases in medical history	0.287	0.003
Presence of renal impairment	0.316	<0.001
Admission ward (CCU or ICU)	0. 146	0.133
No. of prescribed medications to the patient	0.072	0.460

Table 6: The impact of various factors on mortality rate among CICU patients

Factor	Odd ratio Exp (B)	*p*-value
Patient age	0.973	0.502
Medical history	1.521	0.286
Renal failure	1.367	0.726
No of prescribed medications	0.979	0.905
No of medication errors	0.762	0.372
Admission ward	4.254	0.139

DISCUSSION

The results of this study indicate that approximately 8.6% of hospitalized patients were admitted to the CICU, a figure closely comparable to the median admission rate (10%) to the CICU that was observed among critically ill patients in the USA [17]. Regarding the reasons for admission to CICU, the majority of patients (70.6%) who were admitted to the CCU in the current study were suffering from acute coronary syndrome (ST segment elevation myocardial infarction (STEMI), non-ST segment elevation myocardial infarction (NSTEMI), and unstable angina). This was exactly similar to what was found by Bohula *et al*. 2019 [18]. On the other hand, chronic kidney disease (CKD) was the most common reason (31.8%) for admission to the ICU in the current study. This finding is highly expected since most patients with CKD have other serious comorbid conditions such as diabetes mellitus, ischemic heart disease, heart failure, and hypertension; furthermore, CKD patients are at high risk for developing fluid overload and metabolic and electrolyte disturbances, which necessitate admission to the ICU [19,20]. The findings of our study reveal that patients admitted to the CICU received an average of 7.66 medications. For instance, patients in the ICU were prescribed slightly more medications than those in the CCU (8.64 *vs*. 7.41); however, this difference was not statistically significant. Similarly, data from tertiary care hospitals in India show an average of 8.78 medications prescribed to ICU patients [21] and 7.8 medications for CCU patients [22]. These findings highlight the prevalent use of multiple medications in critical care settings. This emphasizes the necessity of meticulous review and supervision of prescribed medications for critically ill patients to avert adverse effects and facilitate optimal outcomes. The current study highlights a concerning prevalence of prescribing errors among critically ill patients, with over 44% of charts in the CCU and approximately 47% in the ICU. For instance, in Saudi Arabia, a neighboring country to Iraq, the prevalence of prescribing errors in the CCU of a military hospital was reported at a markedly lower rate of 7.5% [23]. On the other hand, a study conducted across 79 ICUs in Spain found a medication error prevalence of 25%, with about one-third of these errors classified as prescribing errors. This frequency translates to an approximate prescribing error rate of 9% [24]; such a percentage of prescribing errors is considerably lower than that observed in the current study. Additionally, the average number of errors per patient admitted to the CICU in the current study was 4.36, with an average of 2.29 medications containing errors. This finding was significantly higher than that detected in a 19-bed ICU at a tertiary-level hospital in Johannesburg, in which there was an average of 0.36 prescribing errors per patient and about 0.11 errors per medication prescribed [25]. This substantial difference with a higher prevalence of errors in the Iraqi setting may be attributable to several factors between Iraq and the aforementioned countries, including differences in healthcare infrastructure, medication management protocols, clinical practice standards, staff training, the degree of multidisciplinary involvement in prescribing processes, and the implementation of electronic prescribing systems, which are mostly lacking in Iraq [26,27]. The markedly higher prevalence of prescribing errors in the current study indicates potential areas requiring improvement, such as enhancing prescriber education, implementing robust medication review protocols, and adopting electronic prescribing systems with clinical decision support [28, 29]. Addressing these factors could help align local practices with international standards, ultimately reducing prescribing errors and improving patient safety in critical care units. The results of this study indicated that the majority of prescribing errors were associated with physicians' non-adherence to treatment guidelines. Similarly, several studies identified non-adherence to evidence-based guidelines by physicians as a key predictor of prescribing errors [30] and increased risks to patients [31]. Regarding non-adherence to treatment guidelines, the most frequently observed error among patients admitted to the CCU and ICU in the current study was the omission of an indicated medication, followed by dosing and frequency errors. Similarly, omission errors were identified as the most common prescribing errors in Ethiopian ICUs [32], with dosing and frequency errors ranking as the second and third most prevalent types [33]. Additionally, omission errors were also highly prevalent in the CCUs of hospitals in the USA, indicating that this issue is widespread across different

healthcare settings [8]. On the other hand, the current study found that certain prescribing errors, such as incorrect medication duration and prescribing non-indicated medications, were uncommon in the reviewed charts for patients admitted to the CICU. Similar findings were reported in cross-sectional studies conducted in Saudi Arabia and Spain [34,9]. Regarding pharmaceutical errors, the most frequently observed error in the current study was the failure to order monitoring tests for medications that require such observation, identified in approximately 27% of charts for patients admitted to the CICU. Unfortunately, neglecting this step may significantly increase the risk to patients from medication side effects and potential ineffectiveness [35]. In other countries, monitoring errors were less common. For instance, only 7% of prescriptions in UK hospitals and 0.2% of prescriptions in Saudi Arabia contained monitoring errors [34,35].The high rate of monitoring errors observed in the current study is concerning; however, it is somewhat anticipated given the limited healthcare infrastructure, institutional policies, review systems, and level of training among healthcare providers in Iraq [26,27]. Therefore, there is an urgent need to enhance training and education for Iraqi healthcare workers, particularly those working in critical care units. Additionally, it is essential to review and revise existing institutional policies related to the detection, reporting, and correction of medication errors. Although monitoring errors were detected at a high rate in both the ICU and CCU, they were significantly more prevalent among patients admitted to the ICU. This notable difference can be partly explained by the larger number of medications prescribed in the ICU compared to the CCU, as shown in the current study's results. Additionally, several barriers to effective monitoring of medications in the ICU—such as lack of organizational support, limited physician knowledge about these tests, and insufficient resources for conducting monitoring procedures—may contribute to this disparity [36]. According to the present study results, drug-drug interactions were the second most common prescribing error that related to pharmaceutical issues among patients admitted to the CICU. Similarly, such a problem was also very common in Indian public hospitals [37]. Additionally, Iraqi pharmacists found that drug-drug interactions are a highly prevalent prescribing error in public hospitals [38]. Other errors, such as prescribing two medications from the same pharmaceutical group and prescribing contraindicated medications, were identified in only one chart, pertaining to a patient admitted to the CCU. The current finding is in agreement with a study conducted in the UK, which found that community pharmacists are less likely to observe certain types of errors in physicians' prescriptions, such as duplicate treatments and the prescribing of contraindicated medications [39]. The study results demonstrated that renal impairment was positively and significantly associated with a higher frequency of prescribing errors. Similarly, Milani and colleagues reported that medication errors are more common among patients with chronic kidney disease (CKD) [40]. This correlation was anticipated, as CKD management frequently involves polypharmacy, thereby increasing the risk of medication interactions. Moreover, CKD patients often have multiple comorbidities, which heightens the likelihood of inappropriate or contraindicated treatments. They also commonly require dosage adjustments for numerous medications, potentially leading to dosing errors [41]. While our study found no significant association between factors such as length of stay in the CICU, patient age, admission ward, and the number of prescribed medications with the frequency of prescribing errors, other studies have reported these variables as significant predictors [32,42]. This discrepancy may be attributed to differences in study populations, clinical settings, or methodologies. For instance, variations in healthcare practices, staffing levels, or patient characteristics could influence the impact of these factors on prescribing errors. Additionally, it is possible that our sample size or the nature of the study design limits the detection of these associations. Further research is needed to clarify the role of these factors in different clinical contexts and to determine whether they consistently predict prescribing errors across diverse settings. In the present study, binary regression analysis revealed that none of the examined factors—including patient age, medical history, presence of renal impairment, number of prescribed medications, number of prescribing errors, and admission ward—had a significant impact on patient mortality in the CICU. Similarly, numerous studies have reported comparable findings. For example, a large-scale study found no association between patient age and mortality risk [43]. Other factors, such as disease severity and previous functional status, may confound the effect of age on mortality [44]. Regarding polypharmacy, the literature presents conflicting evidence, with some studies suggesting an increased risk of mortality, while others indicate a decreased risk [45,46]. Additionally, comorbid conditions such as hypertension, ischemic heart disease, and stroke did not significantly elevate mortality risk among ICU patients [47,43]. Furthermore, most medication errors identified did not adversely affect patient outcomes and were therefore considered non-harmful [48]; this may explain the lack of a direct association between the number of prescribing errors and mortality. Finally, short-term mortality appears to be primarily driven by the severity of the acute illness rather than underlying conditions like CKD [20]. Overall, these findings suggest that illness severity, rather than demographic, patient, or medication-related factors, primarily influences mortality among patients admitted to the CICU.

Study limitations

This study has several limitations. First, it was conducted in a single hospital, which may limit the generalizability of the findings. Second, medication history was lacking in most charts, potentially affecting the accuracy of the identified drug-drug interaction rates. Despite these limitations, this is the first study conducted in Iraq focusing on prescribing errors among critically ill patients admitted to the CICU. Consequently, it provides a foundation for future research to investigate the underlying causes of the

high prescribing error rates observed and to develop effective strategies to address this issue in the future.

Conclusion

Prescribing errors were highly prevalent among patients admitted to the CICU, primarily attributable to physicians' poor adherence to treatment guidelines. The most common types of errors included omission of indicated medications, dosing inaccuracies, drug-drug interactions, and inadequate monitoring of prescribed therapies. Additionally, patient medical history—particularly impaired kidney function and the number of comorbidities—was a significant predictor of increased prescribing errors. Despite the high occurrence of errors, no significant association was found between these errors and patient mortality.

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Conflict of interests

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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