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Effects of Clinical Pharmacist Intervention in a Saudi ICU: A Prospective, Cross-Sectional Study

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Abstract* - *Given their contributions to better patient outcomes, medication safety, and lower drug cost, critical care pharmacists are especially prepared to play a major role within the critical care interdisciplinary team in managing the therapeutic element. Consequently, this research set out to evaluate the ICU clinical pharmacist interventions' frequency, kind, and effect, as well as the acceptability of these interventions by the doctors who provide them. The research was prospective and cross-sectional in nature. Over the course of six months, from April 1, 2023, to October 1, 2023, data was collected daily from a minimum of 380 interventions. This research covered all patients hospitalized to the intensive care unit at Saudi Arabia throughout the specified time frame. Over the duration of the 6-month trial, 120 patients had a total of 500 interventions. Of these, 490 (98%) had physician approval for clinical pharmacist treatments. The majority of the recommendations (34.8%, or 174 out of 500) were related to safety concerns; among these, 48.27%, or 48 out of 174, were for medication cessation owing to extended duration, while 30.46%, or 53 out of 174, were for renal dosage modification. Coming up as a close second, another therapeutic intervention involving indication made up 22.8% (114/500). A total of 124 interventions, or 24.8 percent of the total, had some kind of cost-related component, according to the study's findings on cost-saving treatments. The results of this research showed that clinical pharmacists have the potential to improve quality treatment for critically ill patients and lower healthcare expenditures. Furthermore, it provides helpful information on the incorporation of clinical pharmacists in intensive care units, particularly in areas with limited resources.

Keywords:* *Safety, Intensive Care Units, Healthcare, Pharmacist, Physician, Patients.

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INTRODUCTION

Critical care units (ICUs) now include clinical pharmacists as essential members of the interdisciplinary team. Their position in healthcare has grown substantially in recent years. Clinical pharmacists' integration into intensive care unit (ICU) teams in Saudi Arabia has shown encouraging results in improving patient safety and maximizing treatment effectiveness. Medication management, patient outcomes, and healthcare quality as a whole are the primary foci of this introduction, which delves into the critical consequences of clinical pharmacist involvement in Saudi intensive care units. [1]

Safe and effective pharmaceutical usage is the responsibility of clinical pharmacists, who have extensive training and education in pharmacotherapy. The presence of clinical pharmacists may be especially helpful in the intensive care unit (ICU), where patients often confront life-threatening illnesses and complicated treatment plans. Their interventions may include a wide variety of tasks, including educating patients and their families, assisting healthcare practitioners with pharmaceutical information, and adjusting doses. [2]

Thorough medication evaluations are one of the main responsibilities of clinical pharmacists in the intensive care unit. Particularly important in severely sick patients, this includes checking prescription medications for any interactions, duplications, or contraindications and making sure doses are adjusted according to renal and hepatic functions. As an example, clinical pharmacists often intervene by adjusting renal dosages, which means that drugs are

given at the right amounts to patients with different levels of renal impairment. By making these modifications, negative medication responses may be avoided and treatment results can be improved. [3]

The treatment and avoidance of adverse drug reactions are additional important responsibilities of clinical pharmacists. They teach medical professionals vital knowledge about medications, which aids in the identification and management of toxicities and adverse effects. With their expertise in pharmacodynamics and pharmacokinetics, they are able to enhance dosage regimens, leading to better therapeutic efficacy and reduced risks. In critical care units in Saudi Arabia, clinical pharmacists do more than only treat patients; they also help develop and implement new clinical protocols and guidelines. Their input ensures that these criteria are tailored to the specific needs of ICU patients and grounded on research. Through this collaboration, the intensive care unit promotes a culture of safety and a commitment to constant improvement. [4]

When clinical pharmacists become involved, it changes healthcare metrics overall, not just for individual patients. Research has linked their involvement to a decrease in healthcare costs, a decrease in prescription errors, and a reduction in critical care unit stays. These enhancements not only enhance patient care, but they also increase healthcare efficiency generally. [5]

Worldwide, the irrational use of medication is a major concern for public health. More than half of all prescriptions are either prescribed or given incorrectly, according to the World Health Organization. This may lead to medication-related problems (MRPs), more hospitalizations caused by adverse drug events (ADEs), and higher healthcare expenses overall. Patients in hospitals account for around 5% of all adverse drug events (ADEs) in the US. Half of the medication-related adverse drug events (ADEs) that happened during hospitalization were avoidable, according to a French investigation. Furthermore, compared to individuals without ADEs, a large US population research found that deaths from ADEs were 19.18% greater, amounting to 1,971 extra deaths. [6]

In addition to being very harmful to health, ADEs drive up healthcare expenses by USD 11,486 per ADE and prescription expenditures by over 70%. Clinical pharmacists now play a crucial role in the healthcare system and are an essential component of the interdisciplinary management team in the context of ADE prevention and decreased healthcare costs. "Any action taken by a pharmacist that directly results in a change of patient management or therapy" describes the clinical interventions that clinical pharmacists engage in as part of their daily practice. Recent research has shown strong evidence for the significance of clinical pharmacist interventions aimed at decreasing the prescription of unsuitable regimens [7]. But, depending on the study's environment and methodology, the amount of the ability to offset overall healthcare expenses varies. To help decision-makers and legislators better justify funding clinical pharmacy services with wages for staff, it is vital to analyze the economic effect of local clinical pharmacy interventions on resource utilization. [8]

METHODOLOGY

The emergency room of Saudi Arabia's _____ was the site of the research. There were __ residents and __ nurses covering the eight beds in the critical care unit, in addition to two clinical pharmacists and two intensive care experts. A prospective, cross-sectional investigation was conducted here.

Number of Samples

Included in the study were all patients admitted to the intensive care unit between April 1, 2023, and October 1, 2023. A minimum sample size of 380 interventions was required. Epi InfoTM was used. The following criteria were used: 95% confidence interval, expected frequency of 50%, acceptable margin of error of 5%, design effect 1, cluster 1.

Collecting Data

Clinical pharmacist interventions such as prescribing drugs without indications, adding drugs, duplicating, adjusting renal doses, discontinuing drugs due to long duration, drug-drug interactions, adverse drug reactions, intravenous administration, pharmacokinetics, ordering lab tests for monitoring and safety, dosing, and dose frequency were all input into the data collection form. Three years of clinical expertise in intensive care unit settings and two certified critical care pharmacists with master's degrees in clinical pharmacy collected data everyday for six months. At _____ Hospital, the intensive care unit clinical pharmacists go over everything from patient profiles and prescription records to follow-up notes and any relevant physician orders, including test and culture findings. Questions about medications and treatment recommendations are among the topics covered by clinical pharmacists during rounds. Clinical pharmacists discuss matters like as drug adherence with nursing team members after rounds. Clinical pharmacists record these suggestions and interventions on the data collection form along with their result, which is the doctors' acceptance or rejection of them.

There were four categories into which the interventions were classified: (1) indication-related treatments, such medication duplication; (2) safety-related interventions, like adverse drug reactions; (3) dose-related interventions, like Dosing; and (4) other, like medication reconciliation.

Statistical Analysis

Data analysis was carried out using SPSS, version 27.0, which stands for the Statistical Package for the

Social Sciences. The data was analyzed using descriptive and inferential statistics. Quantitative information given as percentages or frequencies. To determine if there was a correlation between the kind of interventions and the level of acceptability among doctors, Fisher's exact test was used. Statistical significance was determined by a p-value less than 0.05 and a confidence interval (CI) of 95%.

RESULTS

In all, 120 patients received a grand total of 500 interventions over the six-month trial period. Medical professionals were in agreement with 490 of these procedures (98%). Concerning safety, 174 (34.8% of the total) recommendations were made, with the biggest number coming from 48 (48.27%) suggestions to stop taking the medicine after a lengthy period of use and the second highest number coming from 53 (30.46%) suggestions to alter the dosage for the kidneys. Ranked second, with 114 cases (or 22.8% of the total), was another therapeutic intervention with an indication. “According to the research, 124 out of the total number of interventions (or 24.31 percent) included some kind of cost-saving measure. The detailed information for each category intervention is shown in Table 1.

Table 1 Classification of Clinical Pharmacist Interventions and Their Adherence Rates

Intervention	Percentages	Acceptance Rate (95% CI)
Treatment Group:		*p* value 0.002
Safety	34.8% (174/500)	98.3%
Dosing	21.4% (112/500)	99.1%
Indication	22.8% (114/500)	91.2%
Miscellaneous	20.% (100/500)	98.1%
Total	**500**	
Treatments pertaining to the diagnosis		
Medication without a specific use	6.1% (7 /114)	57.1% (4/7)
Include medication	85.9% (98/114)	94.1% (98/103)
The act of duplication	7.8% (9/114)	66.7% (6/9)
Total	**114**	
Interventions concerning security		
Varying the dosage for renal	30.46% (53/174)	100% (53/53)
Medications stopped because of extended	48.27% (48/174)	95.8% (46/48)
Interaction between medicines	4.02% (7/174)	100% (7/7)
Medication side effect	4.02% (7/174)	100% (7/7)
Delivery by intravenous infusion	8.62% (15/174)	100% (15/15)
Pharmacodynamic models	4.60% (8/174)	100% (8/8)
Get a lab test ordered for monitoring and safety purposes	20.70% (36 /174)	97.2% (35/36)
Total	**174**	
Interventions concerning dosage		
Dosin	89.28% (100/112)	99% (99/100)
Frequency	10.71% (12/112)	100% (12/12)
Total	**112**	
Initiatives aimed at reducing expenses		93.5%
Varying the dosage for renal	42.74% (53/124)	
Drug withdrawal caused by an excessively lengthy period	38.71% (48/124)	
Medication without a specific use	5.64% (7 /124)	
The act of duplication	7.26% (9/124)	
Interaction between medicines	5.64% (7/124)	
Total	**124**	
Miscellaneous		
Supply the nurse with relevant data	33.0% (33/100)	100% (33/33)
Give the doctor the details	31.0% (31/100)	93.55% (29/31)
Advice gathering	28.0% (28/100)	100% (28/28)
Harmonizing Medication	8.0 %(8/100)	100% (8/8)
Total	**105**	

Table 2: Total intervention percentages.

Intervention	Percentage
Add drug	20.20%
Dosage	19.60%
Renal dose adjustment	10.40%
Supply details for length of time	9.40%
Supply the nurse with relevant data	7.50%
Submit a request for a laboratory evaluation about safety and monitoring.	7.10%
Give the doctor the details	6.10%
Consultation	5.50%
Intravenous administration	2.90%
Dose frequency	2.40%
The act of duplication	1.80%
Pharmacodynamic models	1.60%
Harmonizing Medications	1.60%
Reaction that causes distress	1.40%
Drug with no indication	1.40%
Drug interaction	1.40%

The following is a list of factors that have been found to be associated with physicians' acceptance: the category of interventions had the highest acceptance rate (99.1%; 111/112), the safety category had the second-highest rate (98.3%; 171/174), the indication category had the lowest rate (90.8%; 108/114), and the cost-related interventions category had the lowest rate (93.5%; 116/124).

Advanced medical treatment In addition to their expertise in interdisciplinary team approaches, pharmacists are well-suited to provide the clinical and operational components of pharmacotherapeutic services necessary for the treatment of critically ill patients. The effects of clinical pharmacist treatments on intensive care unit patients are examined in this research. The interventions may be categorized according to their focus: indications, safety, dosage, and other things. Indications, dosage, and other interventions round out the list of suggestions, with safety taking precedence, according to our research.” In contrast to Saudi Arabia, where indications were the most common

interventional placement, safety, miscellaneous, and dosage were the least common, these placements are in line with the results reported at the Alkhor Hospital in Qatar. Apart from that, there were discrepancies with a research that aimed to determine the effect of clinical pharmacy services in chemotherapy infusion clinics for adults. In which medication dosage modifications (51% of treatments), followed by addition (23% of actions), and cessation (21% of interventions), were the most common interventions. Dissimilarities in research designs, patient populations, and drug classes may account for this discrepancy.[9]

From a different angle, one of the most crucial measures for evaluating the clinical pharmacist's function is the frequency with which doctors embrace clinical pharmacist interventions. When asked about their interactions with clinical pharmacists, most Saudi doctors who have worked with them have said that the professionals are knowledgeable about both over-the-counter and prescription medications, and that they often let doctors know if there are any problems with the prescriptions they've written. These results are in line with those of two studies conducted in Saudi Arabia, one in Taif and the other in Jeddah, which found that, respectively, 98.5% and 97% of clinical pharmacist treatments were adopted by doctors. Alkhor Hospital in Qatar had an acceptance rate of 87.2%, whereas India had a rate of 94.8 percent and the United Arab Emirates had a rating of 94.7 percent.20 When compared to other published statistics, this finding was in line with an acceptance rate of 85.5% to 99%. [10

Clinical pharmacists play a crucial role in reducing medication-related problems and improving patient safety. The most common safety intervention is drug discontinuation due to long duration, followed by renal dose adjustment and ordering lab tests for safety and monitoring. A relative overdose on the usual dosage, especially for individuals with renal failure, may cause significant impairment and/or a longer hospital stay. Because they reduce the likelihood of overdose, medication-related complications, and adverse drug responses in this group of patients, these treatments are crucial.

Nearly a quarter of the total interventions had a cost-related component when evaluating cost-saving measures that included renal dosage modification, medication withdrawal owing to lengthy duration, drug with no indications, duplication, and drug interaction into account. These examples show how the clinical pharmacist helps keep medication prices down.22 Earlier studies that looked at how clinical pharmacist treatments affected savings rates came to similar conclusions.[11]

Additionally, clinical pharmacy services lower the cost of possible adverse drug events and pharmaceuticals, according to a research that evaluated the effects of clinical pharmacist intervention on clinical and economic outcomes in a hematology unit.[12]

Aside from being the most common intervention overall, the addition of medications was the most common indication-related intervention. These findings are in line with the reality that most critical care pharmacists also serve as prescribers, a function that is quickly becoming the norm. [13]

When it came to dosage-related treatments, they were by far the most prevalent. These results highlight how clinical pharmacists play an important part in medical rounds and how they collaborate with other members of the healthcare team to determine the best way to administer medications.16 This confirms what previous research in India and Taif, Saudi Arabia, found when they examined the effects of clinical pharmacist treatments. [14]

Preparation and administration of medications constitute the bulk of the data provided to nurses in this research. This is in line with the findings of a study that looked at the preparation and administration of intravenous medications in critically ill patients without a clinical pharmacist present. The study found a total error rate of 33.4%, which supports the importance of the clinical pharmacist's role as a medication expert. This result is comparable to the one in Saudi Arabia, which is 45.7%.[15]

One of the most important things that pharmacists do is consult with other healthcare professionals, offering them reactive advice on specific issues. Consultation was linked to over 50% of the various treatments in our research. Conforming to these results, the number of consultation interventions in Saudi Arabia has increased to 65.[16]

CONCLUSION

This research highlighted the potential for clinical pharmacists to improve quality management for critically ill patients and save healthcare costs via the use of medication optimization, pharmaceutical mistake interception, and a stronger commitment to standardized treatment. In addition to enhancing health care outcomes, the high proportion of physician acceptance of clinical pharmacist treatments suggests that these interventions are highly relevant and foster interprofessional cooperation. In addition, our results highlight the critical role of clinical pharmacists in interdisciplinary healthcare teams and provide useful information for integrating them into intensive care unit settings, particularly in settings with limited resources. That is why it is imperative that lawmakers think about introducing a clinical pharmacist to the intensive care unit.

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