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Experiences of ICU Clinical Pharmacists in Saudi Arabia

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الملخص باللغة العربية

يلعب الصيدلي المتخصص ذو التدريب المتقدم والخبرات في الرعاية الحرجة دورًا مهمًا في إدارة العلاج الدوائي لنوع مهم من المرضى في المنظمة الصحية. لدى هذا النوع من المرضى العديد من الأدوية التي تستخدم طرقًا مختلفة لإعطائها لهم بالإضافة ان كثيرا من مرضى الرعاية الحرجة يعانون من امراض أخرى مزمنة مع قصور في وظائف الأعضاء كالكلى والكبد. يعمل الطاقم الطبي والتمريض الذين يديرون هؤلاء المرضى دائمًا في حالة ضغط مما يقد يعرضهم لارتكاب أخطاء دوائية. يعيش مرضى الرعاية الحرجة في بيئة سريعة الوتيرة وهم معرضون أكثر من غيرهم من المرضى لخطر حدوث الأخطاء الدوائية خاصة عند استخدام العلاجات المعقدة. يمكن للصيدلي السريري في وحدة العناية المركزة المساعدة في تقليل مخاطر مثل هذه الأخطاء من خلال المراجعة الفعالة لأدوية المريض والتأكد من أن كل دواء آمن وفعال وفعال من حيث التكلفة الاقتصادية أيضا فهو يقوم بمعالجة السبب الأساسي للأخطاء الدوائية لتجنبها قبل حدوثها. في هذا التقرير المبسط نهدف إلى مشاركة تجارب الصيدلي الإكلينيكي في وحدة العناية المركزة في أحد المراكز الطبية في المملكة العربية السعودية مما أدى إلى تقليل الأخطاء الدوائية وضمان جودة أفضل للرعاية الطبية والصيدلانية وتوفير التكاليف وزيادة مشاركة الصيدلي في عمل السياسات والإجراءات الصحية مما يضمن استخدام آمن وفعال للدواء.

كلمات مفتاحية: صيدلي اكلينيكي، الرعاية الحرجة، المملكة العربية السعودية

Abstract in English

Specialized pharmacist with advanced training and experiences in critical care plays significant role in pharmacotherapy management of important type of patient population. These types of patients have numerous medications using various routes of administration with many comorbidity conditions. Medical and nursing staff who are managing those patients are always working under stressful condition. Critically ill patients in a fast-paced environment like the ICU are at high risk for medication errors, especially when using complex therapies. The ICU clinical pharmacist can help reduce the risk of such errors by effectively reviewing patient's medications and make sure that every medication is safe, effective, and cost-effective. Also, clinical pharmacists should address the underlying cause of the medication error to avoid them before they occur. In this short communication,

we aim to share the ICU clinical pharmacist's experiences in one center in Saudi Arabia that resulted in reduced medication errors, better quality assurance, cost savings, and increased engagement in hospital policy and procedures.

Keywords: Clinical Pharmacist, critical care, Saudi Arabia

Background

The Intensive Care Unit (ICU) clinical pharmacist serves as an advanced practitioner who provides pharmaceutical care for critically ill patients. The role of the ICU clinical pharmacist is crucial because they manage complex patients receiving numerous medications using various routes of administration.[1,2] These patients can demonstrate severe and rapidly altering pharmacokinetic and pharmacodynamics conditions along with hemodynamic instability. Such changes can affect the absorption, distribution, metabolism, excretion, and overall physiologic effects of drugs.[3.4] ICU clinical pharmacists commonly monitor patient-specific therapies and collaborates with other health-care team providers during the multidisciplinary team round.[1,3] They can intervene and participate in critical quality assurance activities, including those involving high-alert medications.[5] Critically ill patients in a fast-paced environment like the ICU are at high risk for medication errors, especially when using complex therapies.[2,5-6] ICU clinical pharmacists can help reduce the risk of such errors by effectively addressing the underlying cause of the medication error.

They can also join in hospital-wide committees, taking an active role in evaluating and monitoring medication use processes for safety and cost-effectiveness throughout the hospital, not only in the ICU settings.

In this communication, we aim to share the ICU clinical pharmacist's experiences in one center in Saudi Arabia that resulted in reduced medication errors, better quality assurance, cost savings, and increased engagement in hospital policy and procedures.

Medication Error Reductions

One common source of medication error encountered in the ICU when using any dose-adjustable Intravenous (IV) medication with a weight-based dosing strategy is the uncertainty regarding which dosing weight to use.[7] The question may seem simple, but patients in the ICU setting can have variations in weight due to changes in their fluid status. Patients can become dehydrated or fluid overloaded. Several types of weight may be tracked, such as dry weight, current weight, admission weight, ideal weight, or adjusted weight.[7] These fluctuations must be monitored to determine which weight to use for dosing IV medications; the baseline admission weight should typically be used as the default weight for calculating IV infusions with adjustable doses.[7] ICU clinical pharmacists assist with monitoring a patient's daily input and output of fluids as well as the overall cumulative balance for the patient, which helps determine the patient's baseline admission weight, and their interventions can help avoid errors with medications, especially when initiated at different times throughout the course of a patient's admission.[1,2]

Another critical issue is the dosing unit used for IV infusion medications. Dosing errors can arise due to variations in whether the dosing units' patients receive are weight-based or non-weight-based.[7] Inconsistency in the dosing units can lead to patients being under or overdosed, which ultimately can affect the patients clinically. One role of an ICU clinical pharmacist is to implement a strategy to standardize dosing units for dose-adjustable high-alert IV medications.[1,5,7] This would facilitate a standard of practice and reduce the risk of medication errors. Conducting a medication-use evaluation can help identify an opportunity to improve the use of IV infusion medications.[5,8] Medications such as epinephrine, norepinephrine, midazolam, fentanyl, phenylephrine, nitroglycerin, and isoproterenol all contain multiple dosing unit options.[7] For instance, epinephrine, isoproterenol, nitroglycerin, norepinephrine, and phenylephrine dosing units can be based on micrograms per kilogram (mcg/kg) or micrograms per minute (mcg/min). Midazolam dosing units can include milligrams per hour (mg/hr), milligrams per kilogram of body weight per hour (mg/kg/hr), and micrograms per kilogram of body weight per minute (mcg/kg/min). Further, fentanyl dosing units can include micrograms per kilogram per hour (mcg/kg/hour) or micrograms per hour (mcg/hour). And, in addition to all these variations in dosing units, these medications can also be dosed as milliliters per hour (mL/hr).[7] A clinical pharmacist-led intervention can standardize dosing units to help avoid errors with medications, especially when initiated at different times throughout the course of a patient's admission.[1,2] The ICU clinical pharmacist can and must emphasize to the multidisciplinary team that doses of these medications are not adjusted solely based on the daily changes of a patient's weight.[7]

Instead, the medication dose should be titrated based on clinical evaluations, including monitoring parameters and treatment goals of the patient.

Quality Assurance Activities

The role of an ICU clinical pharmacist is not only to reduce medication errors in the ICU setting but to improve the overall quality of care of patients by minimizing complications leading to morbidity and mortality. ICU pharmacists committed to optimizing medication therapy also contribute to other quality-assurance activities such as conducting adverse drug event reporting and representing the pharmacy department on hospital-wide committees.[5,8] Many high-alert medications are used in the ICU, which is why the ICU pharmacist must monitor for appropriateness of therapy and effectiveness. Their role is to ensure that optimal levels of sedation are achieved, pain is controlled, and they make recommendations based on a patient's laboratory values and organ function as to which sedatives produce an optimal and safe level of sedation. During multidisciplinary rounds, they are continually evaluating the need for continuous sedation, using measuring tools such as the Richmond Agitation-Sedation Scale (RASS) that help regulate the agitation or sedation level of a person. There is evidence that when ICU pharmacists enforce sedation protocol in patients receiving continuous sedation, the duration of mechanical ventilation they need is significantly decreased.[9]

Another quality assurance activity in which ICU pharmacists actively engage is monitoring nursing-led protocols for certain high-alert IV continuous infusions,

Such as unfractionated heparin and regular insulin. The ICU pharmacist can help achieve targeted aPTT levels and monitor appropriate rate adjustments being made for heparin to achieve its therapeutic range. ICU pharmacists are also able to ensure that patients are neither hypoglycemic nor hyperglycemic by monitoring the insulin infusion rate adjustments and can further evaluate the absolute need for it as well.

Cost-Saving Practice

We proposed a potentially cost-effective strategy of preparing continuous norepinephrine infusion by suggesting a dilution change in the current order set that could help save our hospital approximately $30,000 annually. The present dilution involved using either 1.5 vials or 3.5 vials of 4 mg of norepinephrine in 250 mL of either D5W, D5NS, or NS. This dilution resulted in large amounts of wastage because the vials were for a single use only. The proposed cost-effective dilution change would use either one or two vials of 4 mg of norepinephrine, which would reduce the current consumption by 50% and eventually lead to zero wastage. By using one vial of 4 mg norepinephrine, a concentration of 16 mcg/mL could be prepared, while using two vials would make a 32 mcg/ml concentration. Both concentrations are appropriate, and higher concentration dilutions are usually necessary for patients with severe fluid restriction in critically ill patients requiring higher doses.

Hospital Guidelines Involvement

ICU pharmacists can engage in updating hospital guidelines and current policies and procedures for their respective institutions. For example, by providing critical care expertise,

we updated the policy and procedures for specific types of high-alert medications that could be used during procedural sedation and analgesia by non-anesthesiologists. A medication list was created that included dosing information along with the pharmacokinetic and pharmacodynamics properties of each agent. The medication list provided a reference that would help prevent or reduce medication errors from occurring, such as an overdose or underdose. Not incidentally, the medication list also included the option of giving sedatives through the intranasal route if needed in certain circumstances, such as when IV access is not readily available or convenient. High-alert medications such as ketamine, midazolam, fentanyl, dexmedetomidine, naloxone, and flumazenil can all be given through the intranasal route.

Several ICU-related protocols require the active involvement of an ICU pharmacist. Management of stress hyperglycemia was not standardized among physicians in our center, but an ICU pharmacist was able to suggest developing a protocol related to stress hyperglycemia management in the ICU settings. The protocol was developed and led by ICU pharmacists with a multidisciplinary ICU team. Another example of an ICU protocol actively developed by the ICU pharmacists was the severe hyponatremia management protocol for ICU patients. We noticed multiple dosing and calculation errors in the fluid and sodium requirements that were caught by the ICU pharmacist. The ICU pharmacist developed a severe hyponatremia protocol so the therapy and dosing could be standardized among our practitioners.

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Conclusion

Many studies have addressed the significant value added to clinical services by including a clinical pharmacist rounding with the medical team in ICU. The role of the ICU pharmacist should be highlighted in clinical bedside activities and extended to other activities, including quality assurance activities, cost-saving practices, and involvement in hospital policy and procedures. Large multicenter observational studies are needed to further evaluate and confirm the importance of the ICU pharmacist in health care in Saudi Arabia.

References

1. Borthwick M. The role of the pharmacist in the intensive care unit. J Intensive Care Soc. 2019 20(2):161-164.
2. Choi L, Ferrell B, Vasilevskis E, et al. Population pharmacokinetics of fentanyl in the critically ill. Crit Care Med. 2016 Jan;44(1):64-72.
3. Jiang S, Zheng X, Li X, et al. Effectiveness of pharmaceutical care in an intensive care unit from China. Saudi Med J. 2012 33(7):756-762.
4. Jung B, Couldry R, Wilkinson S, et al. Implementation of standardized dosing units for i.v. medications. Am J Health-System Pharm. 2014 71:2153-2158.
5. American Society of Health-System Pharmacists. ASHP guidelines on preventing medication errors in hospitals. Am J Health-System Pharm. 2018 75:1493-1517.
6. American Society of Health-System Pharmacists. ASHP guidelines on medication-use evaluation. Am J Health-System Pharm. 1996 53:1953-5.
7. Stollings, JL, Bloom, SL, Wang, L, et al. Critical care pharmacists and medication management in an ICU recovery center. Ann Pharmacother. 2018 52(8):713-723.
8. Wang T, Benedict N, Olsen K, et al. Effect of critical care pharmacist's intervention on medication errors: A systematic review and meta-analysis of observational studies. J Crit Care. 2015 30(5):1101-1106.
9. Marshall, J, Finn, C, Theodore, A. Impact of a clinical pharmacist-enforced intensive care unit sedation protocol on duration of mechanical ventilation and hospital stay. Crit Care Med. 2008 36(2):427-433.