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Management of High-Risk Medications in Hospital Pharmacies

Khalid Saud Alazmi[1], Sultan Eid F AlRashdi[2], Bathir saleh alazmee[3], Mubarak Fulayyih[4], Munif mohammed Alrashdi[5], Salman Daghman Alrashdi[6], BarraK mansour Alrashdi[7], Naif Hawaf ALrasheedi[8], Abdullah Jazaa Salem Alanazi[9], Mamdouh Mnwer Jred Al onazi[10]

1. *Pharmacist, Cardiac center at Hail, Hail Health Cluster*
2. *Pharmacist, King khalid hospital, Hail Health Cluster*
3. *Pharmacist, King salman specialist hospital, Hail Health Cluster*
4. *ALRASHDI, Pharmacist, Alsulaimy hospital, Hail Health Cluster*
5. *Pharmacy Technician, Iradah Complex for Mental Health in Hail, Hail Health Cluster*
6. *Pharmacist, King khalid hospital, Hail Health Cluster*
7. *Clinical Pharmacist, Maternity and Children's Hospital,Hail Health Cluster*
8. *Pharmacy technician, Maternity and Children*
9. *Tabuk Health Cluster - Eskan Halat Ammar Primary Healthcare Centre, pharmacy Technician*
10. *King Fahd Specialist Hospital in Qassim – Buraidah, pharmacy Technician*

Abstract
Medications considered "high-risk problematic medications" are those that pose a risk of injury if they are misused. In the hospital system, it is pharmacists who verify the safe use of medications for inpatients. Hospital pharmacists decide whether to stock high-risk medications that have an extensive burden of clinical therapeutics, especially eligibility. In a hospital pharmacy, we are involved in many activities that could potentially pose clinical risk depending on how they are managed. Therefore, the burden of risk management on hospital pharmacy is significant. These high-risk medications must be properly managed, and the clinical risk must be properly managed.

It is pharmacists who must determine if the benefits derived from particular high-risk problematic medications used in a hospital will outweigh the risks. First, we must identify high-risk medications, and we then need to determine which ones will be carried. We need to stock not only by providing information as a store but also by participating in a policy-making process as a member of the medical institution. High-risk medications that the hospital carries are preferably limited to reduce the number of medications potentially available to patients. As there is limited time in a hospital pharmacy, the dangerous nature of these high-risk medications increases. In this paper, we present some considerations that we need to consider, commonly stocked medications, and the history of high-risk medications using our hospital as an example. (Magro, 2021)

1. Introduction

Medication management is a critical function of hospitals and focuses on ensuring that patients get the right medicines, right doses, at the right times, and at the right costs. High-risk medications are medications that have been found to have a higher propensity to cause harm if they are used incorrectly. These medications need special handling and management to ensure that harmful errors do not occur. The management of high-risk medications in the hospital pharmacy includes their procurement, security, storage,

inventory management, preparation and dispensing, transportation, education, and policy management. These processes should be designed to contain checks, balances, and safeguards. The prevailing philosophy is error prevention, as errors can result in potentially fatal consequences for the patient and can be very costly to the hospital. The need to maintain a sharp focus on improving the management system for high-risk medications currently and in the future is the subject of this chapter. The chapter also discusses recently encountered problems related to integrating new technologies and architectures and offers solutions to these issues. (Linden-Lahti et al.2021)

1.1. Background and Significance

One of the most common interventions conducted by hospital pharmacists to address medication safety is management related to high-risk medications. Although there is no universally accepted definition, high-risk medications are generally those known to have a significant potential risk or have been associated with certain serious and devastating adverse events. It is widely recognized that opioid analgesics, usually used for moderate to severe pain relief, are considered high-risk medications, particularly in high doses or when intravenously administered. Despite their well-established clinical significance, these agents are indispensable in hospitals because of their potency and reliable efficacy. Additional high-risk medications also include concentrated electrolyte solutions or those that are prone to mix-up errors, such as heparins or insulins. (Villoutreix et al.2020)

The necessity of systemic organizational protections, such as formulary restrictions, bar-code verification, patient-specific dilution of highly concentrated intravenous medications, and limited access, to prevent adverse drug errors associated with high-risk medications has been acknowledged. Traditionally, many of these organizational safeguards are actively enforced by pharmacist oversight in the operation of hospital pharmacies, particularly in computerized order entry settings. However, such practices are failing to keep up with the challenges related to the increasing use of these high-risk medications in hospital settings. The principal contributing factors to the observed shortcomings are likely

multifactorial and secondary to, but not limited to, the continued evolution of more potent opioids to handle cases of environmental disaster or the opioid crisis, increased use of extended-release opioids for the treatment of chronic pain, and the escalating use of high-dose methadone for the treatment of cancer-related pain.

1.2. Scope and Objectives

The scope of this text is to address the various aspects of the management of medications at high risk of medication errors and patient harm in the hospital setting. It aims to give the hospital pharmacy a comprehensive overview of the various aspects of the management, including guidelines, procedure development, availability, staff training, storage, distribution, unique issues in compounding potential interventions, and the value of clinical involvement in patient-specific decision-making. In its comprehensive approach and systematic analysis of all features to consider in managing high-alert reminder and community-based high-risk medications, this study is unique. The current understanding of high-risk medications exploits the role of the high-risk medication list in the context of patient-centered decision-making based on current clinical status and providing high-quality care. (Gurwitz et al.2021)

The goals of the study were to classify medications as high risk when used in the hospital and explore the risk factors contributing to the risk classification. The key elements in specific classes are explored and how to improve the involvement of hospital pharmacy staff in identifying issues and providing solutions. A committee of clinical and lab pharmacy specialists wrote a high-risk medication list. The team consisted of three specialists in pharmacy practice, an infectious diseases pharmacist, a head of the medicines information department, a talented care pharmacist, a nurse specialist in theater, and a critical care nurse. The aim was to identify key concerns and discussion points for administrative staff when dispensing the medications.

2. Regulatory Framework

The regulation of compounding and dispensing of high-risk medications is done at the state level since the enactment of the Drug Quality and Security Act in 2013. Prior to this, the authority over active pharmaceutical manufacturing was held while the state boards of pharmacy regulated traditional compounding. In response to multistate outbreaks of infections due to contaminated sterile compounded products, Congress enacted the Drug Quality and Security Act. The product's safety and efficacy are nevertheless monitored. In an astonishingly short period of time, state-level regulations of sterile compounding by hospital-based pharmacies also entered into effect. Even prior to this, due to public concerns and some local adverse occurrences, storehouses were well aware of the fragile nature of sterile compounding. Stringent standards and guidelines of compounding are issued and revised regularly collectively with other organizations providing healthcare services. These standards prohibit bacteriostatic additives and limit time to less than 6 hours for first administration and less than 24 hours for total use, unless specific conditions are met for high-risk medication once punctured. These compounded preparations produced by pharmacists also include pre-filled syringes and morphine patient-controlled analgesia syringes, usually oxygen rejection syringes, except for proprietary frozen products. As a correction compounder, every hospital pharmacy must be proficient in

organizing, establishing medication stability data, preventing contamination, and recovering from a catastrophic event. (Gangi, 2021)

2.1. Key Regulations and Guidelines

High-alert medications should be based on independent standards. In the United States, a list has been announced, promoting safe dispensing and management of medication. The list in 2007 comprised 11 classes and 517 substances, and the initial list in 2008 included 12 million medication orders. Despite the high economic burden and serious issues involved, no regulation mandating the establishment of medication safety management guidelines or subsidies has been established globally. Japan has a rapidly increasing elderly population, with advancements into the digital age also progressing remarkably. As medication accident numbers have continued to rise every year, concerns have been expressed regarding the state of medical safety.

Considering the incidents taking place in the United States, Japan should establish a concrete set of basic principles for cautious and safe management of medication through adherence to a nationwide agreement, and then disseminate them. Japan also now requires medical safety guidelines to be established, with personnel trained in their use. There should also be legislation in place that makes it mandatory for hospitals to establish such guidelines, and through implementation, patient care should be prioritized everywhere. This will also support the inclusion of a 'patient-centric drug record' as one of the guaranteeing criteria in the regular assessment of clinical laboratory improvement amendments, as an international standard for food and drug safety and harmonization. (Naruse et al.2022)

2.2. Compliance and Enforcement

Current federal and state laws and regulations related to the management of high-alert medications and other high-risk medications at the federal and state levels were reviewed. Pharmacy practice regulations were reviewed within a sample of several states. Survey data were ascertained from pharmacy practice regulators in seven states for additional insight into the frequency of compliance inspections. Both federal and state regulations mandate the safe and efficacious preparation and dispensing of these products, but federal and state pharmacy regulations that relate specifically to the topic generally infer requirements for their storage, handling, and dispensing. Exceptions to these practices include the use of safe harbor rules, previously obtained waivers, or exacting conditions of exemption as determined by the board of pharmacy. Inspection data from a sample of states' boards of pharmacy were corroborative of the regulatory data, and this may present a compliance issue in some practice settings. (Abdullah, 2021)

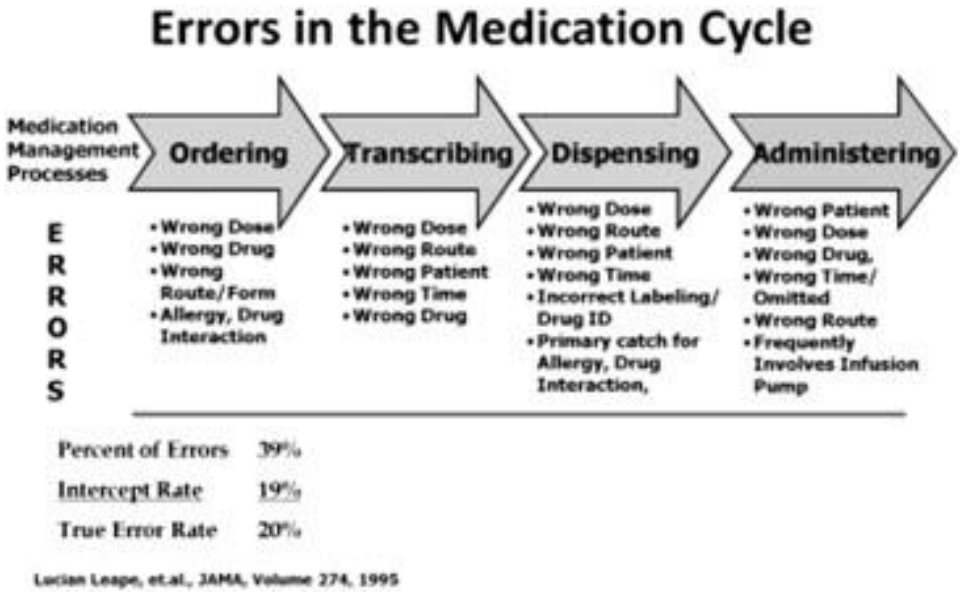
The defective preparation of a high-risk combination product used parenterally is the subject matter of a never event known as look-alike products, and these inferences are followed through to state boards of pharmacy. However, this study demonstrates that the modesty of regulatory directives may frustrate and limit effective compliance inspections. For example, a limiting checklist item resulted in an overstatement of compliance with storage and labeling directives for insulin in hospital pharmacy practice settings, in that the checklist used by inspectors was inadequate in identifying the real-world practice contrasts. Inspectors must be trained to determine the difference from the actual practice of what to

look for as stated above. If states want to assure themselves of the safety and quality of implemented or refined training of inspection staff, this is warranted.

3. Characteristics of High-Risk Medications

Although risk criteria can be based on different factors, such as intrinsic pharmacological properties of a drug and vulnerability of the patient, drugs are generally considered high risk because of a combination of reasons. Often, numerous risk factors, known as "red flags," must be in place before a drug can be considered "high risk." For instance, in the case of methotrexate, "risk factors" include excessive dosages or dosing schedules that exceed approved labeling, use for a non-approved indication, administration as a continuous infusion, excessive doses that are given in incrementally increasing volumes of parenteral diluent, co-administration with other anti-cancer drugs or drugs that may potentiate its action, and failure to adjust dosing after tests show that adverse reactions are imminent. Epidurals for acute pain management present several critical risk-related characteristics. They strike with a high frequency, they are hidden from the children during the phase in which they manifest, requiring only a few drops to trigger an adverse reaction. The first manifestations of an error are often generic and nonspecific and are often ignored by the parents, especially in the most critical phase of hospital stay. (Safaei et al.2021)

Another critical feature is that drug interaction events are generally observed over an approximately 40-minute time frame, do not continue upon termination of the epidural, and have a clear temporal pattern with respect to initiation of dosing, termination of dosing, and dose titrations. A study of characteristics of medication errors documented that high-alert medications accounted for a significant percentage of those errors that resulted in fatalities, increased length of hospital stay, or permanent disability. High-risk drugs have been defined as those drugs where significant preventable harm can result with the use of the drug, the patient is most at risk of harm, or the drug is most complex to manage. In addition, heparin, as used in hospital settings, fulfills all of the Risk Management Framework Criteria.



3.1. Definition and Classification

Medications are an essential part of hospital treatment, but they can also be the cause of serious problems for patients who use them incorrectly. Adverse effects due to medication errors represent a major problem for public health services due to the high costs they imply. Currently, there is a clear interest in improving the safety of all stages of the medication usage cycle in hospitals, from prescribing to administration. Medication management is the sum of all the measures and actions needed to obtain the maximum possible benefit from the medicines taken by the patient while minimizing the likelihood of adverse events. Until relatively recently, most of the work developed in the management of high-risk medications was focused on diminishing the number of errors or incidents that could occur during the prescribing, dispensing, and administration process, which peak harmful effects on patients.

Nowadays, we know that the management of high-risk medications in the hospital pharmacy is a more comprehensive concept that goes beyond the mere concern for the integrity and efficacy of the treatment taken by patients hospitalized in the establishment. The potential consequences of a benefit-risk relationship in medications that could have an impact on the hospital pharmacy's human resources or on the environment may also form part of this concept. In today's high-technology healthcare structures, such as hospitals, it seems clear that some medications or situations related to their use may be the sources of high patient risk. The reason for the high risk may depend on the patient, a healthcare professional, the system, or external needs, so safety improvements must be geared to the mitigation of this combination of a medicament's intrinsic qualities and the deficiencies of the surrounding systems. (Dumitrescu et al.2020)

3.2. Common Examples

There are also medications that are considered high risk due to the frequency of medication errors reported and their contribution to adverse events. High alert medications are those that carry specific risks and are frequently associated with severe harm or patient injury when errors occur. These specific characteristics have been widely accepted by the medical community, establishing that these medications have a greater potential to cause serious patient harm. Some medications have an additional risk due to their current use as part of drug preparation protocols and are classified as high-risk medications. Lists of these medications have been created that are used as quality checks in the pharmacy prior to their dispensing to the patient.

Methotrexate has been identified as a high alert medication in hospital pharmacy practices and is also considered high risk for pharmacy practice, having four defined ways of use: oral, parenteral, into the spinal canal, and as a treatment for inflammatory joint arthritis. The risk arises from the dose and incorrect administration frequency, for example, a high dose, accidental daily prescription, and/or miscommunication with the caregivers. The hazard is further increased when it is used for inflammatory joint arthritis, for which lower doses of methotrexate are employed. The compound is often packaged in vials containing 50 mg and cannot be subdivided because of its stability once the vial is opened, so another presentation has been designed for use in an arthritis treatment protocol to prevent medication errors from the use of the first presentation. (Song et al.2022)

4. Risk Management Strategies

High-risk medications are a significant problem in healthcare. Thus, hospital pharmacies employ various risk management strategies with high-risk medications. Risk assessment and management should be at the heart of patient care services provided by hospital pharmacies. These management strategies are critical in the following environments: chemotherapy or biohazard drugs, anti-infective agents, anticoagulant agents, cardiovascular agents, parenteral nutrition, anesthesia medications, investigational medications, concentrated electrolytes, immunosuppressive agents, and immunomodulating agents carried in hospital pharmacies as a potential source of microbial contamination. To effectively manage high-risk medications, it is essential for hospital pharmacies to partner with and support other healthcare team members in the following activities: provide continual education, establish medication guidelines, perform utilization reviews, engage in regular surveillance activities, assess and develop alerts within information management systems, and provide ancillary support functions. Pharmacy management strategies for high-risk drugs will require both financial and personnel commitments. Effective identification and management of these medications in hospital pharmacies can have a significant and positive impact on patient outcomes while, at the same time, ensuring the safety of staff members. (Airaksinen et al.2021)

4.1. Medication Safety Assessment

Medication errors have been a threat to patient safety for more than 40 years and are estimated to affect 1 in 10 hospital patients worldwide. An estimated 35% of hospital medication errors are due to errors in hospital pharmacy services. These errors can emanate from the presence of high-risk medicines in hospital pharmacies, inducing overwork; infrastructure or service problems; inadequate quality management policies; access to pharmaceutical information; or the experience and competence levels of pharmacy department staff; and medication order profile characteristics in hospitals. It is known that pharmacists who provide pharmaceutical care services can prevent many errors made by

other health professionals, but no robust methods exist for quantifying this eventuality. In addition, verification of the robustness and effectiveness of the methods used in various regions, along with the quality assurance services provided by hospital pharmacies and the contributions to the rational use of high-risk medicines in tradition-based hospitals, have not been investigated. Therefore, assessing the current situation is needed. (Aseeri et al.2020)

One important job for pharmacists working in hospital pharmacy departments is the assessment of the uncertainty and susceptibility of patients to high-risk medicines and medicine-related health outcomes. High-risk medicines are known to increase both the rate of consultations and the use of medical devices not reimbursed by the National Health System. High-risk medicines require close monitoring due to their potential risk for causing injury or harm to patients if not appropriately managed. These medications should follow defined protocols and can be examined by laboratory tests and observations to ensure patient safety. When patient uncertainty about high-risk medicines is reduced, these medications can be safely prescribed, and appropriate information can be given to patients and other health professionals about the purpose of the medicines and how they should be taken. Mutual understanding between patients and healthcare professionals is important in various clinical settings as this improves patient adherence to treatment. The first assessment tool specifically designed for indicating Patient Uncertainty and Susceptibility (PUS) has been developed and validated for use in Arabic, which is the language commonly used in certain countries. (Chennamadhavuni et al.2022)

4.2. Error Reporting and Analysis

Data from error reporting can provide valuable information that may be helpful in understanding the cause and the defenses most relevant to medication errors. However, the underreporting found in all error reporting systems undermines their value. In reporting systems that advocate voluntary reports, reports may not be an accurate representation of the incidence of errors. Our logistic regression model offers an estimate of the factors influencing the voluntary report behavior of clinical pharmacists. In our research, pharmacists reported that no harm/harm to the patient, high highlight/no highlight, no wrong medication/wrong medication, not new medication/new medication, and fewer duties were significant factors affecting the decision to report a medication error. (Hong, 2023)

Our analysis shows that the greatest barrier to incident reporting was related to the fact that the incident did not result in harm or a potentially unsafe situation. An important aspect of mandatory reporting systems is increased sensitivity of the system to all errors. Encourage voluntary reporting methods and feedback. In addition, hospital pharmacies should conduct routine interviews to gauge how the systems are functioning and any obstacles or barriers. Safe medication means much more than a barcode or a check-off list. Vigilance and dedication have always been the tools of the trade for healthcare professionals. That will not change.

5. Technology and Automation

Robotic systems offer significant benefits in the centralized management of high-risk medications. Robotic systems move prescription medications from the pharmacy to the patient care units in sealed, tamper-evident containers, thus reducing the potential for error.

These robots operate on a number of criteria for safety, including dual dilution systems and barcode validation. Additionally, barcode scanning provides validation of all doses moving through the robots, and nurses at the patient care unit are required to barcode scan at dispensing to validate the correct patient prior to medication removal.

Barcoded and cassette dispensing cabinets have become the standard automated medication management systems for the vast majority of hospitals. Today's automated dispensing cabinets have the capability of issuing a wide range of medications, controlled substances, and IV products. Automated dispensing cabinet systems feature medications in barcoded, unit dose form, high visibility and tamper-evident packaging, and the system's ability to recover from a power failure or other interruption. These systems offer numerous reports and audits, decentralized packaging, safe administration potential, and proximity to key areas, such as the inpatient unit or the emergency department. Pharmacists and pharmacy technicians enjoy increased security in accessing medications, as well as decreased traveling time for drug distribution tasks. (Rhodes et al., 2022)

5.1. Barcoding Systems

Innovative technology is moving more and more towards the implementation of our next standard. The use of computer solutions in cases of barcodes is not new to pharmacy practice, but in reality, this decision has some reservations. To speed up this process, a pharmacy must use a computer system with a real-time application that will allow employees to confirm a selection through the medication pack using the barcode reader. Another important factor is the need for barcodes on all drugs. Unfortunately, many medications do not have barcodes on the unit dose package, and barcodes are used for bulk or multiple dose packages only. (Holze et al.2023)

To ensure that barcode systems in hospital pharmacies work, the hospital must insist on having the technology package label both the small unit-dose tablets and the larger unit dose baskets or cups used in some hospitals. This combination enables hospital pharmacies to use productivity-improving barcode technologies that can be used to check all the contents when completing the recoat for medication. Results are printed directly to the recorder, giving barcode instructions.

5.2. Automated Dispensing Cabinets

5.2.1. Introduction In the contemporary public medical system, most inpatients' medications rely on medications dispensed by the hospital pharmacy unit. Due to the frequent dispensing of a large amount of medications, the time required for manual dispensing delays the inpatient's timely intake. Early intake will result in undertreatment. Therefore, dispensing medication by unit dose is essential. To date, a number of computerized prescription orders have been introduced to improve the efficiency of the pharmacy department and the safety of patients. Automated Dispensing Cabinets are one of these. Using this platform, the nursing staff can handle all the small materials, such as dressings, alcohol wipes, etc., and perform barcode scanning to pick up the medicines. If the ADC can be used to handle low-risk medications, such as those for gastrointestinal surgery, it can reduce the burden on pharmacy personnel and will be applied in numerous wards. (Pedersen et al.2021)

6. Staff Training and Education

Continuing staff education and training are important components of a pharmacy department's overall quality improvement and risk management programs. Initial job training in aspects of medication use safety should include awareness of potential adverse outcomes resulting from human errors or system failures. Increasing staff expertise in the safety-related aspects of the work they perform will not only improve an individual's job performance but also increase job satisfaction and self-confidence. Following are a number of common strategies for promoting staff education and training. Ongoing safety training should be incorporated into new employee orientation sessions and existing staff development programs. Pharmacy leaders are encouraged to identify factors that could contribute to production pressures, including penalties related to preventable adverse outcomes. Encouragement is made for the pharmacist to publicly or privately congratulate staff members for identifying or preventing a near miss, without placing blame or embarrassment. Organizations are encouraged to create and maintain mechanisms for periodically appraising staff members' levels of satisfaction and stress. (Atmaja et al., 2022)

6.1. Continuing Education Programs

With all the development of hospital pharmacy management towards evidence-based practice and international standards, the professional quality and ability of hospital pharmacists have been given greater recognition and attention. However, the work pressure on hospital pharmacists is increasing, and pharmacist burnout is becoming an emerging issue. The main reason for this situation is that most of the professional systems are still rigid and lag behind. There is little job training for hospital pharmacists, and few continuing education programs for pharmacists in Asian country hospitals. How to maximize the professional expertise and quality of the hospital pharmacist team and keep them enthusiastic about their work is an urgent problem for pharmacy leadership in public hospitals. The introduction of essential, best evidence medications and management tools designed for continuing education programs for pharmacists in public hospitals is a concern worldwide. (Blue et al.2022)

Research has shown that essential and best evidence medications are the foundation of clinical drug use in hospitals. Continuing professional development program requirements have become more and more strict. It is recognized that when workplace resources, such as the work environment or the team, are maintained and enhanced, pharmacists, as well as other health workers, will be more confident and efficient at work and can sustain a professional commitment to the hospital. Is the introduction of essential, best evidence medications and management tools designed for continuing education programs for pharmacists in an Asian country a helpful pathway for achieving this scenario?

6.2. Simulation Training

One ideal method for high-risk medication preparation training is simulation practice. This kind of practice has been developed for many years in various human fields because of its effectiveness at providing hands-on practice with minimum risk to patients. However, for pharmacy staff, simulation training is rarely available, particularly programs adapted from hospital dispensaries. Currently, many teaching and training materials are available for e-learning and simulation training, adapted from hospital dispensaries and simply designed.

Some high-risk medication preparations have been shown at low costs or for free. However, again, such materials only illustrate simple preparations; they are not available for patients at discharge from in-patients. On the other hand, despite non-aqueous injection preparation being a high-risk medication with a high incidence, only a little is available in training, for example, antidote preparation, intravenous anesthetic preparation, or fluconazole preparation. (Alastalo et al.2023)

It is important that pharmacies in hospitals treat patients who need such kinds of medicine because currently, if a patient needs TPN during scheduled replacement, doctors have to replace the preparation time. Therefore, according to increasing prescriptions and dispensing, the generalization of this training in each hospital inpatient pharmacy is desirable. Furthermore, if this training can contribute to nursing pharmacies located in distant areas, hospital costs can be decreased.

7. Quality Assurance and Monitoring

The ongoing assessment and improvement of the medication management process is essential to ensure that procedures are followed, that errors are detected, and that opportunities for improvement are identified. In a pharmacy system that uses clinical pharmacists, the highest study priority (management) is what these care providers are primarily responsible for 8–12 hours a day. Quality can never exceed the quality of the people or tools used in the process, so the organization must invest resources in those individuals and tools.

High-risk medications are defined as those that require special measures to optimize safety, prescribing, dispensing, and administration. To ensure that such measures are consistently followed, a review of the incidence of use of the high-risk drugs and the management process measures should occur at least monthly by a multidisciplinary group including pharmacists, physicians, and nursing staff. Products that have a higher relative risk should have more stringent process measures of monitoring or other intervention. Evaluation of the difficult economic, personnel, and regulatory effects on the organization should also be conducted, as well as clearly defining which individual or entity is explicitly charged with safety for each of the management tasks. This is important for maintaining the above discussion: understanding the complex, overlapping responsibilities and transfer of patient care can result. (Watts et al.2023)

7.1. Audits and Inspections

Audits and inspections were the most frequently reported activities utilized by hospital pharmacists, as well as being the most effective activities in their opinion. No significant difference was found in mean effectiveness scores reported by different pharmacy directors. Reasons in support of this finding may relate to the value of others viewing the process, routing systems for verifying compliance, alerts programmed within pharmacy computer systems, and the availability of medication profile monitoring by pharmacists.

With the convenience of current pharmacy computer systems, all high-risk medications may be included within pharmacy monitoring systems. The concurrent view of the patient profile by the pharmacists allows further verification of prescriber rationale, dosing regimen, concomitant medications, and laboratory values. Medication profile monitoring may therefore be the most comprehensive process, although multiple methods of verifying

the prescriber's orders may reduce the risk of medication errors. Support of the process is found in guidelines for ward stock medication class assignment, where staff in pharmacy monitor these medications. Focused information is helpful in gathering interventions to reduce therapy duration, optimize individual dosage regimens, and minimize polypharmacy. (Razonable et al.2021)

7.2. Performance Metrics

The purpose of establishing key performance metrics for high-risk medications is to encourage meaningful advancements and practical improvements. The application of the metrics can, first and foremost, improve patient safety but can also affect professional liability, drive growth, manage the formation of partnerships, improve financial performance, and drive accountability to effective practices more quickly. Second, the pharmacists are rewarded for being the quality leader in the area of medication management and patient safety. The incentive is for the institution to become a full partner with the pharmacy staff to improve outcomes or to switch from a contracting mode to a true partnership. Third, the metrics can be used in managing and assessing the professional development of the pharmacy staff. Comparing current metric measurements to those that involve benchmarking or consulting with a collaborative organization, performance, and the coming value working concepts. No single process or fiscal metric can be viewed in isolation for improvement potential. The purpose of the targeted pilot programs is to provide a safe learning environment in which short-term fixes can have long-term benefits in shaping the staffing needs. (Health Organization, 2020)

8. Collaboration with Healthcare Providers

High-risk medications have the greatest potential harm for patients if used in error, and hospital pharmacists are frequently involved in their management in various countries. In general, pharmacist-mediated interventions in the use of high-risk medications have enhanced the quality of care for patients, such as the prevention of medication errors and adverse drug reactions. The success of pharmacist-mediated interventions, in part, is due to collaboration among healthcare professionals. In fact, studies have revealed that pharmacist input improves patient compliance with dosing, simplifies drug regimens, requires fewer physician visits, and increases patient satisfaction. Notably, ward pharmacy staff are hospital pharmacists who work directly in collaboration with ward-based healthcare professionals in an acute hospital, which includes doctors, nurses, and pharmacists in some hospitals. However, few studies have focused on the roles of ward pharmacy staff, so many questions remain concerning the organization of ward pharmacy staff interventions. The present study was unable to provide a comprehensive picture of ward pharmacy staff interventions because there is no standardized intervention. We expect the findings in this study, which support the relevance of certain high-risk medications and indicate the reality of ward pharmacy staff interventions, to raise the interest of researchers in this topic. (Gurwitz et al.2021)

8.1. Interdisciplinary Communication

The communication between the different services is an essential tool that can prevent errors derived from lack of information and must function as a channel of authentication of actions. For this, a specific unit management has been developed to manage the information requirements that exist among different people who participate in it.

Interdisciplinary patient care becomes a challenge at the time of administration of drugs with a narrow therapeutic margin, about which health professionals advise regarding their adjustment. What is clear is that the actions of both the pharmacist and the nursing team with these types of drugs are basic. This starts with a correct communication route.

8.2. Medication Reconciliation

have reviewed the management of high-risk medications in hospital pharmacies. They have divided the management of high-risk medications into five major sections: medication reconciliation, storage, labels, dispensing, and education, and have presented a detailed concept and illustrative examples in each section.

In the transition of care from the ED to the inpatient unit, discrepancies are prevalent. Patients may find themselves taking duplicate medications or none at all if medications are not reconciled on arrival. Other patients may be taking medications in different dosages than they currently require. Incomplete physician knowledge of the patient's medications at discharge was shown to contribute to these discrepancies. However, how wrong information was obtained was not assessed. For ambulatory care, medications on medication lists, in EHR systems, and for prescription orders are accessible to physicians through an ED, primary care, or subspecialty care and the inpatient unit. Errors may also occur during the manual entry of information into these systems. When listing medications for patients being admitted to the inpatient unit, listed medications must be verified. compared the completeness of four sources of medication information for patients admitted to the ambulatory care internal medicine service from the ED. A patient's history of medications was more accurate if it presented a level of completeness than any other source of information accessed by the ED providers. (Gustafsson et al.2024)

9. Patient Education and Counseling

Pharmacist counseling is an important component in the safe management of high-risk medications. Hospital patients are particularly vulnerable, given the extremely difficult situation in which they find themselves. Patients are usually not feeling well and are not at their peak for learning new information. Especially at the time of discharge, patients are being bombarded with new information about their disease, new drug regimens, follow-ups, and recommendations. Pharmacists should be patient, ask their patients if they have any questions, and at the same time encourage and motivate them to ask for assistance and to share their doubts and health concerns. Counseling should be addressed in a variety of aspects, taking into consideration the patient's expectations: the patient's knowledge about the new medication, mode of administration, dosage, important clinical aspects, adverse reactions, interactions, food or alcohol interactions, precautions while taking or storing the new drug, what to do if a dose is missed, the importance of following the medication regimens and the duration of therapy, follow-up, and struggle with side effects. The pharmacist should use a patient-centered counseling model. (Alves et al.2021)

10. Emergency Preparedness and Response

Emergency preparedness and response involves planning and ensuring the capability to identify, develop, and implement pharmaceutical services needed to respond efficiently and effectively to a health-related event and provide services to support the continued treatment of existing patients while addressing the needs of new patients generated by the event. The plan then provides for implementation and coordination with the care of the

general emergency incident population. This section discusses a program to address three levels of emergency preparedness and response. The first level addresses emergencies impacting individual patients in the local area, such as severe allergic reactions to medication, terrorist contamination impacting a regional area, or the crash of an airliner being tended for a long layover day in the local airport. The second level addresses wide area emergencies such as riot control situations. The third level addresses large-scale emergencies impacting the entire area or multiple care delivery systems such as a tornado, which might impact one or more large system hospitals. (Hodkinson et al.2020)

11. Case Studies and Best Practices

1. Introduction Guideline 11.1: Engage in case studies and best practice sharing with peers to improve all steps of the high-alert medication process by seeking out similar-sized organizations with similar reimbursement structures and either similar access to the same products or similar access challenges, and requesting on-site tours or consultation visits with their departments or ongoing advice sharing. Many organizations that manufacture filled products are willing to share ongoing improvement projects, particularly after they have reached their goals. Also, ask your group purchasing organization if it has identified top performers that are willing to share their best practices in purchasing or diversion prevention. Bring back best practices and engage in case studies with the staff members who will be involved in or affected by the change so they are part of the process. Use benchmarking if this process applies to an area of the facility that benefits from comparing your facility to another. (Sluggett et al.2020)

12. Future Trends and Innovations

Barring extraordinary events, it is likely that high-risk medication management will become more challenging in the next 5 to 10 years as the complexity of care continues to increase. The pressures to enhance patient safety, implement automation, reduce costs, and improve throughput for all patients, including those taking or being considered for high-risk medications, will not abate. They will create a need for more sophisticated technology and software to ensure hospital pharmacy and other staff members and managers find the solutions they need more quickly and easily in the future. The future will likely bring smarter systems that proactively provide the right information when and where it is needed to perform the assessment and associated tasks for high-risk medications. As a result of the solutions provided, the right patient care and safety will be supported. Staff members will also be supported by these capabilities in increasingly remote locations wherever the point of care might be.

Future interfaces for staff members will need to accommodate events and consequences by the use of more telemedicine that communicates back to hospital platforms and systems. The context variety of the residency that the hospital provides for nurse faculty educators features faculty who each attend hospital units. They interface with an events process logic uploaded to their devices to document for students; educational needs at beds and medication administrations. These are integrated in real-time with the national pharmacy database, which also highlights relevant clinical issues, such as learning about high-risk medications. User interfaces are specifically designed to mimic the steps in a decision-making and problem-solving process encompassing the expert habit of mind. Staff

members can see the relationships between events and prior planning, the present emphasis, and possible future effects upheld by the narratives and documents.

13. Conclusion and Recommendations

In conclusion, high-risk medications have the potential for harm and should be managed properly. Hospital pharmacies play an important role in storing and distributing them to minimize the risks involved. Weaknesses or improper design of hospital pharmacy storage can lead to an increased risk of storage and distribution errors. In this study, the identification and classification results of the high-risk medications influencing the distribution and storage of hospital pharmacies were obtained. In light of this result, recommendations have been made with the aim of preventing errors that may occur in the storage and distribution in hospital pharmacies and minimizing the known issues. These recommendations are classified under three different topics: environment and storage units, distribution process, and personnel. One of the main factors for preventing errors in the administration of medications to the patient is the proper storage and distribution of drugs in hospital pharmacies. These requirements not only require specific organizational measures, but also need the standardization of the containers where the drugs are stored, particularly in terms of visual appearance. In addition, the storage, logistics, distribution, security, and control of these containers must be managed properly. It is known that the storage and distribution system in hospital pharmacies is complex due to the large number of drug references used and their worldwide presence. The fact that these medications are often stored in storage units at relatively high frequencies and the high volume of storage units used are among the factors that increase the risk. The research revealed that more than 80% of high-risk medications were stored in hospital pharmacy storage units, and these medications are more affected by the personnel performing the distribution. (Algarni et al.2021)

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