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HYPER VIGILANCE MEDICATIONS (YOU SHOULD NEVER GIVE WITHOUT DOUBLE-CHECKING)

Dr. Raghavendra Rao M. V.*[1], Dr Chinnababu Sunkavalli[2], Dr. Sreevani Namani[3], Dr. Shyamala[4], Dr. Srinivasa Rao Gummadidala[5], Dr. Mubasheer Ali[6]

[1]Professor of Microbiology, and Senior Executive Vice-President, World Academy of Medical Sciences, Netherlands, Europe.
[2]Clinical Director & Consultant Surgical Oncologist, Hitek City Yashoda Hospital, Hyderabad, India.
[3]Assistant Professor, Department of Biochemistry, Commonwealth University College of Medicine, Saint Lucia, Caribbean islands.
[4]Assistant Professor, Department of Physiology, Commonwealth University College of Medicine, Saint Lucia, Caribbean islands.
[5]Professor, Dept. of Radiology, Dr. V R K. Women's Medical College, Teaching Hospital and Research Centre, Hyderabad, India.
[6]Professor and Head, Department of General Medicine, Shadan Institute of Medical Sciences, Hyderabad, TS, India.

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***Corresponding Author: Dr. Raghavendra Rao M. V.**
Professor of Microbiology, and Senior Executive Vice-President, World Academy of Medical Sciences, Netherlands, Europe.
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ABSTRACT

Ensuring the safe use of high-vigilance (high-alert) medications remains one of the most important responsibilities in modern clinical practice. Never rush a high-alert medication. One extra minite save a life. High-vigilance (high-alert) medications, although therapeutically essential, carry a significant risk of patient harm if prescribed, dispensed, or administered without strict verification protocols. A fundamental safety principle is that high-alert medications should never be administered without independent double-checking and appropriate clinical validation. From a patient safety perspective, structured safety checkpoints are essential. These include dose verification, confirmation of clinical indication, assessment of renal and hepatic function for dose adjustments, and careful review of potential drug interactions before administration. While technological safeguards and automated alerts are helpful, they cannot replace sound clinical judgement. Technology should therefore function as a support system rather than a substitute for physician oversight. There is also a strong need for institutional safety protocols such as LASA (Look-Alike Sound-Alike) drug precautions, standardized prescribing practices, and mandatory documentation systems. Regular training of nursing staff and junior doctors is equally important in minimizing medication errors, particularly with high-risk medications such as insulin, anticoagulants, sedatives, chemotherapeutic agents, and vasoactive drugs. Another critical component is the development of a culture of safety in which questioning, clarification, and cross-verification are actively encouraged. Medication safety should always be considered a shared responsibility of the entire healthcare team rather than the duty of a single individual.

KEYWORDS: High-vigilance (high-alert) medications, High alert medications (HAM), Medication errors (ME).

INTRODUCTION

High alert medications (HAM) are those that, although not the most frequently involved in medication errors (ME), have a high risk of causing significant damage to patients due to failure in the process of their use.[1] The consequences of these damages tend to be more serious, and the damages resulting from these errors can be permanent or even result in the patient's death.[2] Patient safety entities and researchers claim that HAM are independent predictors of patient damage.[3] Unfractionated heparin is an anticoagulant used for the prevention and treatment of thrombotic events, including deep vein thrombosis, pulmonary embolism, and atrial fibrillation.[4] Fentanyl exhibits vastly different properties and pharmacokinetics. Clinically, its most frequent use is as a sedative in intubated patients and in severe cases of pain in patients with renal failure due to its primarily hepatic elimination.[5]

Evidence that the current official list of drugs most likely to cause harm when errors occur is not yet abundant in the literature.[6]

Methotrexate is a folic acid antagonist indicated for the treatment of rheumatoid arthritis because of its high potency and efficacy; it can also help treat patients with juvenile idiopathic arthritis.[7]

Aminopterin, the parent compound of methotrexate, was first successfully used to treat childhood leukemia.[8]

Sodré et al. (2020) observed that out of 15 drugs on the list of HAM of the Institute of Safe Practices with Medicines (ISMP), only six had scientific evidence that they were more likely to cause harm due to ME.[9]

For these medications to be included on the list, the risk of error and its consequences must be frequent and significant, which does not always apply to all high-risk medications. In this regard, drugs with high toxicity but a low incidence of error or reduced clinical impact may be omitted.[10]

Additionally, effective safety practices can reduce the need for high surveillance for other drugs. The ISMP periodically reviews these lists to align safety practices with the latest data on errors and clinical impact, as demonstrated in the 2024 update.[11]

Patients admitted to intensive care units (ICU) are at a higher risk of errors with medications due to the complexity of their conditions, the need for urgent interventions, and the considerable workload of the ICU team.[12,13]

In the United States and the United Kingdom, moderate, severe, and fatal damage account for 4 % to 5 % of reported medication errors in the ICU.[14]

Furthermore, ME is associated with increased healthcare costs. A study conducted in an intensive care unit (ICU) found that these errors could add up to R$ 121.92 (approximately USD 25.00) to hospitalization costs.[15]

The literature reports that between 27 % and 72 % of ME involved HAM, representing 11 to 33 % of all medications analyzed.[16]

Methotrexate is also effective for patients who have received a donated organ because of its anti-inflammatory and immunomodulatory activity.[17]

Additionally, methotrexate can be combined with anti-TNF agents and is effective for treating patients with ulcerative colitis, carcinoma of the breast, small-cell carcinoma of the lung, epidermal tumors of the head and neck, and carcinoma of the ovary.[18]

A systematic review identified that 0.01 % of the harm caused by ME involving HAM resulted in death. The severity of errors ranged from 0.1 % to 19.2 % for moderate errors, 0.2 % to 15.4 % for severe errors, and 1.9 % were lethal for patients.[19]

The American College of Chest Physicians (ACCP) recommends the use of heparin for various thrombotic conditions, including atrial fibrillation undergoing cardioversion, endocarditis, systemic embolism, and venous thrombosis (20)

High Alert Medications

(You should never give without double-checking)

So always double-check with your colleague before giving.

Potasium

It can lead to cardiac complications when given incorrectly. Must never be given IV push.Must be diluted and given slowly. Always double-check the dose concentration and infusion rate.

Insulin

The wrong dose can cause life-threatening hypoglycaemia. Always double check dose and type (Short-Vs long acting)

Narcotics/Opioids

Wrong administration can cause respiratory depression.

Always double-check with your colleague and assess the respiratory rate and sedation scale before giving.

Chemotherapy Medications

These require independent verification. They are too dangerous to give alone. Always double-check the drug, dose, and route with your colleague. And always wear your PPE

Magnesium Sulphate

It can cau cause respiratory depression or toxicity risk if given wrongly. always double-check with a colleague. and confirm dose, route.

Blood Transfusion

Giving the wrong type can causelife-threatening hemolytic reaction. Always double-check with a colleague and confirmpatients identity, blood type, Unit number, a nd expitry date. Observe the patient for the first fifteen minutes. Most reactions occur at this time.

Common High-Alert Medication Categories

- **Anticoagulants (IV and Oral)**

Heparin

Can cause severe bleeding or clotting risk if given incorrectly; always double-check with a colleague. The units vs. mL can be misread easily. Verify infusion and monitor PPE. Unfractionated heparin is an anticoagulant used for the prevention and treatment of thrombotic events, including deep vein thrombosis, pulmonary embolism, and atrial fibrillation. Heparin is also indicated for preventing clot formation during procedures such as cardiac surgery, extracorporeal circulation, dialysis, and continuous renal replacement therapy. In addition to approved indications, heparin is widely utilized in hospitals for various off-label uses. This activity outlines the indications, mechanism of action, adverse effects, contraindications, monitoring parameters, and toxicity associated with heparin administration. This activity also provides healthcare professionals with the knowledge and skills to understand heparin pharmacology and enhance their ability to use, monitor, and manage this high-risk medication effectively, supporting the delivery of individualized, high-quality care.[21]

Warfarin

Warfarin is an anticoagulant used to prevent and treat venous thrombosis and thromboembolic events, as well as conditions such as myocardial infarction and atrial fibrillation. Warfarin inhibits the synthesis of vitamin K-dependent clotting factors, reducing clotting ability. Close monitoring of prothrombin time and the international normalized ratio (INR) is essential to ensure therapeutic effectiveness and minimize adverse events, such as bleeding.[22]

Severe adverse effects of warfarin include bleeding and significant hemorrhage. Significant hemorrhage, examples of which include intracranial hemorrhage, gastrointestinal bleeding, hematemesis, intraocular bleeding, and hemarthrosis, can occur at virtually any body site. Patients should receive education about easy bleeding or bruising, a common adverse effect.[23]

A clinician should also counsel patients about properly managing cuts, bruises, and nosebleeds. The risk of bleeding and hemorrhage is dependent on multiple variables, including the intensity of anticoagulation and patient susceptibility. Patients should undergo a risk assessment, with appropriate adjustments to their treatment plan made accordingly. Other adverse effects include nausea, vomiting, abdominal pain, bloating, flatulence, and an altered sense of taste. There are rare cases of purple toe syndrome and warfarin-induced skin necrosis, in addition to reports of calciphylaxis associated with warfarin therapy.[24]

Enoxaparin

Enoxaparin is a low molecular weight heparin (LMWH) and was first approved for medical use in 1993. It is derived from heparin. It has FDA approval for the following clinical conditions: acute coronary syndromes, deep venous thrombosis (DVT) treatment and prophylaxis, treatment for pulmonary embolism (PE), venous thromboembolism (VTE) treatment, and prophylaxis in a variety of scenarios, percutaneous coronary intervention (PCI), and periprocedural anticoagulation, among others. This activity will highlight the mechanism of action, adverse event profile, pharmacology, monitoring, and relevant interactions of enoxaparin, pertinent for interprofessional team members in treating patients with conditions where this agent is indicated.[25]

Enoxaparin has a similar adverse effect profile to heparin. Because of the reduced effectiveness of the antidote (e.g., protamine), bleeding complications can be severe and life-threatening. The following are the important adverse drug reactions of enoxaparin. Bleeding: the most common adverse effect, Heparin-induced thrombocytopenia,[26] It also causes bleeding or painat injection site, Nausea, confusion, headache, Hypoaldosteronism, Gastrointestinal bleeding and Rectal sheath hematoma.[27]

Insulin

The wrong dose can cause life-threatening hypoglycaemia. Always double check dose and type (Short-Vs long acting)

Hypoglycemia is the most serious adverse effect of insulin therapy and the major barrier to achieving glycemic targets in patients with type 1diabetes and insulin-requiring type 2 diabetes.[28]

Intensive insulin therapy in patients with type 1 diabetes in the DCCT was associated with a 2-3 fold increase in severe hypoglycemia (SH), defined as hypoglycemia requiring assistance from others.[29]

In studies of intensive therapy in type 2 diabetes, including the UKPDS, VADT, ADVANCE, and ACCORD trials, intensive therapy resulted in significantly more common SH when compared with standard therapy.[30,31]

SH can cause confusion, motor vehicle accidents, seizures, and coma, and is estimated to be a cause of death in 4-10% of patients with type 1 diabetes.[32]

In one study, the adjusted probability of SH was found to range between 1.02 to 3.04% in patients with type 2 diabetes, depending on clinical complexity and intensity of treatment.[33]

Patients with type 2 diabetes who have had SH are at increased risk of death regardless of the intensity of their glycemic control. Hypoglycemia increases heart rate, systolic blood pressure, myocardial contractility, and cardiac output, which may adversely affect those with diabetes who frequently have underlying coronary artery disease (CAD).[34]

Glucose levels below 70 mg/dl have been shown to cause ischemic ECG changes in patients with type 2 diabetes and CAD during continuous glucose and ECG monitoring.[35]

Opioids and Narcotics

Fentanyl, a potent lipid-soluble opioid that was first synthesized more than 40 years ago, is still the most popular opioid used in the perioperative period throughout the world. Fentanyl's introduction, versatility, and popularity have resulted in its use in many acute and chronic pain conditions and a multitude of novel delivery systems in the last two decades.[36]

Side effects

A medicine may cause some unwanted effects. Although not all of these side effects may occur, if they do occur, they may need medical attention.

- Chest pain or discomfort, difficult or troubled breathing, irregular, fast or slow, or shallow breathing, lightheadedness, dizziness, or fainting
- pale or blue lips, fingernails, or skin, severe muscle stiffness, slow or irregular heartbeat, and unusual tiredness

Morphine

It remains a foundational agent in the treatment of moderate to severe pain, both acute and chronic, with particular value in oncology, palliative care, and vaso-occlusive crises associated with sickle cell disease. This activity equips healthcare professionals with essential knowledge of morphine's FDA-approved indications and a comprehensive review of its mechanism of action, pharmacokinetics, and key contraindications. It also addresses proper administration techniques, potential drug interactions, and adverse effects, particularly those emphasized in FDA-issued warnings, to support safe and informed clinical decision-making.[37]

Among the more common adverse effects of morphine administration is constipation. This effect occurs by stimulating μ-opioid receptors in the myenteric plexus, thereby inhibiting gastric emptying and reducing peristalsis. Other common side effects include central nervous system depression, nausea, vomiting, and urinary retention. Respiratory depression is among the more serious adverse reactions of opiate use that is especially important to monitor in the postoperative patient population.[38]

Other reported side effects include lightheadedness, sedation, and dizziness. Patients often report nausea and vomiting, which is why morphine is frequently administered with an antiemetic such as ondansetron.[39]

Other effects include euphoria, dysphoria, agitation, dry mouth, anorexia, and biliary tract spasms, which is why some physicians will avoid morphine when patients present with right upper quadrant pain and suspect possible biliary tract pathology. Morphine can also affect the cardiovascular system and reportedly can cause flushing, bradycardia, hypotension, and syncope. Patients can experience pruritus, urticaria, edema, and other skin rashes. One meta-analysis indicated that intrathecal morphine significantly increases postoperative nausea and vomiting, urinary retention, and pruritus.[40]

Adrenal insufficiency has been reported with prolonged opioid use, typically after more than one month. Symptoms may include nausea, vomiting, anorexia, fatigue, weakness, dizziness, and hypotension. Diagnosis should be confirmed with testing, and treatment involves physiologic corticosteroid replacement.[41]

Propofol

Propofol is an intravenous agent commonly used for induction and maintenance of anesthesia, procedural and critical care sedation in children. The mechanisms of action on the central nervous system involve interactions at various neurotransmitter receptors, especially the gamma-aminobutyric acid A receptor. Approved for use in the United States by the Federal Drugs and Administration (FDA) in 1989.[42]

Without doubt, pain associated with a propofol injection is the most common adverse effect of propofol.[43]

About 85% of pediatric patients experience pain on injection, with a higher incidence in younger children.[44]

The cause of pain is still unknown, but many mechanisms have been proposed. Many factors appear to affect the incidence and severity of pain, which include, but are not limited to: size of the vein, site of the injection, speed of the injection, speed of the intravenous carrier fluid, and the concomitant use of drugs such as local anesthetics, non-steroidal anti-inflammatory drugs, ketamine, and opiates.[45]

In 1981, Briggs *et. al*. were the first to report an increased incidence of pain with propofol administration in the dorsum of the hand than in the antecubital vein,[143] a finding that was replicated in 1991 by Hannallah *et. al*. in the pediatric population.[46]

Further studies by Scott *et. al*., pointed out that vein size is an important factor in the causation of pain.[47]

There was no pain associated with injecting propofol into a large vein such as the antecubital fossa, presumably because the drug was injected into the midstream and, thus, had minimal contact with the vein wall. Additionally, the composition of nociceptors along the endothelial wall may differ between small and large veins.[48]

It was suggested that pain originates from the contact of propofol with the neural elements within the vein and is related to the propofol concentration in the free aqueous phase

Epinephrine

Epinephrine, a widely used medication and hormone, is critical in managing various medical conditions due to its potent action on the sympathetic nervous system. Epinephrine is approved by the US Food and Drug Administration (FDA) for treating type 1 hypersensitivity reactions (including anaphylaxis), managing hypotension from septic shock, and inducing mydriasis during intraocular surgeries. Epinephrine exerts its effects through α- and β-adrenergic receptors with dose-dependent actions as a sympathomimetic catecholamine. Low doses primarily activate β-receptors, enhancing bronchodilation and cardiac activity, while higher doses engage α-receptors to induce vasoconstriction and increase vascular tone.[49]

Adverse effects of the drug include:

- Central nervous system: Anxiety, dizziness, nervousness, agitation, headache, and exacerbation of Parkinson's disease.
- Cardiovascular: Arrhythmias, chest pain, hypertension, palpitations, tachycardia, cerebrovascular accidents, ventricular ectopy, vasospasm, and tissue ischemia.
- Dermatologic: Gangrene at the injection site (especially in the buttocks) and skin necrosis with extravasation.
- Endocrine: Hyperglycemia, hypokalemia, and lactic acidosis.
- Gastrointestinal: Nausea, vomiting, and an increase in aspartate transaminase and alanine transaminase.
- Neuromuscular: Tremors and weakness.
- Renal: Decreased renal perfusion.
- Respiratory: Dyspnea and pulmonary edema.

CONCLUSION

In addition, the use of system-based safeguards such as electronic prescribing alerts, barcode medication administration, and checklist-based drug administration workflows can significantly reduce preventable errors when implemented alongside strong clinical vigilance. Ultimately, patient safety in the use of high-risk medications depends on disciplined systems, continuous professional education, and a clinical mindset that prioritizes verification over assumption. The guiding principle remains clear: high-alert medications should only be administered when they are clinically justified, carefully verified, and independently cross-checked.

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