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The "Never" List: Promoting Patient Safety by Preventing Medication Error

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ABSTRACT

Medication errors represent the largest category of adverse events affecting hospitalized patients. Some fatal medication errors occurred as a result of administration of an incorrect drug and/or improper dosing of a drug. After repeated incidences of such serious medication errors, the Joint Commission on Accreditation of Healthcare Organization (JCAHO) has established essential patient safety goals requiring each health care organization to implement comprehensive medication reconciliation at admission, transfer, and discharge in a way that maintains patient safety at all times.

The purpose of this "Never" list is to present a gentle reminder to all healthcare providers to be more vigilant towards some serious medication errors.

Keywords: Medication error, Patient safety, Risk.

INTRODUTION

According to Institute of Medicine's (IOM) in its report "To Err Is Human: Building a Safer Health System", medication-related errors are considered a significant cause of mortality. These errors accounted for 0.8% of outpatient deaths, and 0.1% of inpatient deaths, with overall estimated error to account for more than 7,000 deaths annually [1].

Following reports of deaths from accidental injection of undiluted potassium chloride, the WHO listed error prevention as a top priority for patient safety and health care quality improvement [2]. Thereafter, many hospitals removed concentrated solutions of potassium chloride from nursing units.

Phillips Jerry and his colleagues in their study "Retrospective analysis of mortalities associated with medication errors." published in the American journal of health-system pharmacy, concluded that the fatal medication errors accounted for approximately 10% of medication errors reported to FDA. These fatal errors were most frequently as a result of administration of an incorrect drug and/or improper dosing [3].

1. **Never use these abbreviations: U, IU, µg, 5.0 (trailing zero), .5, QD, QOD, MS, MSO_4, $MgSO_4$.**

Background: Pharmacists responsible for interpreting, and processing medication orders may misinterpret an abbreviation and change the intended meaning. The analysis of abbreviations as part of 30,000 medication error reports concluded that nearly 5% of all errors reported to MEDMARX in three years' time were attributable to abbreviations [4].

To fulfil the patient safety goal, the Joint Commission on

Accreditation of Healthcare Organization (JCAHO) urges health care organizations to maintain a standardized list of abbreviations, acronyms, and symbols that are not to be used [5].

Risk: Abbreviations are barrier to communication, which is harmful to patient safety [5].

Ten-fold errors in drug strength and dosage have occurred with decimals due to the use of a trailing zero (5.0 for 5) or the absence of a leading zero (.5 for 0.5). If not prevented, this error would likely result in a patient having a potentially harming drug dose [6,7].

Remedy: Never use these prescribing abbreviations: U, IU, µg, 5.0 (trailing zero), .5, QD, QOD, MS, MSO_4, $MgSO_4$.

Instead use: Unit, microgram, 5, 0.5 (leading zero), Daily, Every other day, Morphine, Magnesium.

2. Never administer vinca alkaloids intrathecally

Background: Vinca alkaloids are chemotherapy drugs that are intended to be administered intravenously. Vincristine has been used widely for many years and most oncology teams are familiar with it. However, despite its extensive use, this drug has been associated frequently with serious medication errors.

Risk: Vincristine is nearly fatal if given intrathecally and associated with an ascending paralysis and pain [8]. The problem comes from inadvertent intrathecal vincristine administration that occurs when a syringe containing vincristine is mixed up with another syringe of a drug to be given intrathecally, for example, methotrexate or cytarabine.

Remedy: Dilute intravenous vincristine and other vinca alkaloids in a minibag that contains a volume that is too large for intrathecal administration (e.g., 50 mL for adults and 25 mL for pediatrics). Organizations that support using minibags to administer vincristine and other vinca alkaloids include: Institute for Safe Medication Practices (ISMP) [9]. The Joint Commission on Accreditation of Healthcare Organization (JCAHO) and World Health Organization (WHO) [10,11].

3. Never administer IV potassium chloride undiluted

Background: Potassium chloride is widely administered intravenously in diluted solutions to treat low potassium levels (hypokalaemia) in seriously sick patients. Potassium chloride concentrate ampoules can look very similar to other injectable medicines like sodium chloride or water for injection. Worldwide reports have identified a number of incidents where potassium chloride concentrate has been accidentally administered in place of sodium chloride or water for injection to patients with fatal results [12].

Risk: The risks associated with intravenous potassium chloride are well known. If injected too rapidly or undiluted, potassium chloride it may cause cardiac arrest and death within minutes [12]. The common cause of such incidents was the unintentional use of potassium chloride concentrate solution for sodium chloride solution and thereby administering lethal dose of potassium to the patient.

Remedy: Potassium chloride ampoules should not be kept in resuscitation trolleys or general wards. The maximum rate of potassium chloride administration via peripheral lines is 10 mmol per hour. Make sure that potassium chloride is thoroughly mixed, unshaken bags are extremely hazardous. Assess the storage of potassium chloride ampoules and premixed solutions to ensure they are stored separately and could be readily identified [12,13].

4. Never amphotericin B or oxaliplatin with normal saline

Background: Stability of many drugs is affected by the types of infusion vehicle used for reconstitution or dilution prior to administration of those drugs. For example, amphotericin B (antifungal agent), or oxaliplatin (chemotherapeutic agent), can be stable in dextrose 5%. However, when mixed with sodium chloride, they will degrade rapidly to form precipitation [14].

Risk: Inappropriate mixing can cause impurities and/or precipitation of the intravenous drug and severe harm to the patient [14]. The resulting clinical consequences may include therapeutic failures due to drug inactivation, catheter occlusions, and varying levels of harm due to particulate embolization, ranging from thrombophlebitis to multi-organ failure or even

death [15].

Remedy: Amphotericin B and oxaliplatin should never be mixed with sodium chloride as they will interact with it and precipitate. No other drugs should be infused through the line used for administration of any of these drugs. The solution must be further diluted in an infusion solution of dextrose 5%. The infusion line should be flushed with dextrose 5%, prior to administration of any concomitant medication [16,17].

The infusion bag should be inspected visually for impurities and discoloration before administration. If impurities observed, the drug or solution should be discarded.

5. Never irrigate deep/cavity wounds with hydrogen peroxide

Background: Traditionally, hydrogen peroxide (H_2O_2) is widely used as an antiseptic for irrigation of superficial wounds and for cleansing of surgical wounds. However, there have been many case reports of inappropriate use that lead to intraoperative oxygen embolism with serious morbidity and mortality consequences [18,19]. Gaseous emboli result from the entry of gaseous oxygen into the circulation by intravascular absorption of hydrogen peroxide and the formation of bubbles.

Risk: After catalysis of hydrogen peroxide when in contact with the body, oxygen bubbles will be released and diffuse into the venous circulation causing morbidity or even mortality of patients. In addition to oxygen gas formation, hydrogen peroxide exerts direct cytotoxicity and lipid peroxidation. Each 1 ml of hydrogen peroxide 3% is capable of releasing 10 ml of oxygen [20]. When the oxygen produced exceeds the solubility in the blood, arterial and venous gas embolism occur. This can be lethal when hydrogen peroxide used in closed cavities or deep wounds [21,22].

Remedy: Irrigation of a closed cavities or deep wounds with hydrogen peroxide is associated with high risk and should be avoided. Use other antiseptics like aqueous povidone iodine instead [23].

CONCLUSION

The main medical objective is to make health care safe and create a culture where the risk is recognized as everyone's responsibility. To start with, healthcare professionals should have thorough knowledge and training sessions on safe drug prescribing and administration. Furthermore, the core curricula in the medical schools should employ learning outcomes and proper assessment specifically addressing the issue of patient safety and medication errors.

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