AORN Guidance Statement: Safe Medication Practices in Perioperative Settings Across the Life Span

Introduction

This guidance statement provides a framework for perioperative registered nurses to develop, implement, and evaluate safe medication management practices specific to the perioperative setting. This evidenced-based framework may be used to facilitate policy development and provide a foundation for the creation of quality improvement (QI)/process improvement (PI) monitors. It is the responsibility of individual health care organizations to develop a culture of medication safety. Proactively reviewing medication errors from the viewpoint of "systems failures" and "systems solutions" will help encourage a culture free from shame and blame.

Perioperative practice settings addressed by this document include traditional operating rooms, ambulatory surgery units, physicians' offices, cardiac catheterization suites, endoscopy suites, radiology departments, and all other areas where operative and invasive procedures may be performed. For the purpose of this document, the term OR is inclusive of all perioperative practice environments.

First published in May 2002, the current guidance statement has been reviewed and updated by AORN's Presidential Commission on Patient Safety, in collaboration with the United States Pharmacopeia (USP), to reflect current safe medication practices.

Background

The National Institute of Medicine report *To Err Is Human: Building a Better Health System* increased awareness of medication errors. The report noted that "medication errors account for one out of 131 outpatient deaths and one out of 854 inpatient deaths."[1] Medication errors can originate at any point in the medication use process and affect patients of all ages. Medication error poses a substantial threat to patients. The perioperative setting creates additional challenges for safe medication administration practices. Related factors affecting the medication process in the perioperative environment include

- the aseptic dispensing of medications onto the sterile field,
- an intermediary to receive and transfer dispensed medications to the scrubbed licensed practitioner (eg, surgeon),
- time-sensitive conditions, and
- sensory distractions intrinsic to the environment.

Specific concerns associated with medication errors in the perioperative setting include, but are not limited to,

- inconsistent practices to communicate current and previous medication regimes (ie, medication reconciliation);
- verbal orders delivered through surgical masks may be muffled and contribute to confusion in the medication order (eg, name, strength, and/or dose);
- incomplete, ambiguous, incorrect, or illegibly written or spoken orders;
- inaccurate, illegible, or outdated surgical preference cards;
- removal of the contents from the original manufacturer's packaging to aseptically deliver contents onto the sterile field;
- limited knowledge of medications by scrubbed allied heath professionals receiving medications onto the sterile field;
- inconsistent labeling of medications on and off the sterile field;
- medication dispensed to the sterile field may be handled by multiple individuals before reaching the licensed individual administering the medication;
- high-alert medications available in multiple dose forms and concentrations;

- look-alike and sound-alike medications stored in close proximity;
- patient care complexity requiring rapid perioperative interventions;
- extended work hours leading to health care worker fatigue;
- care provided by multiple health care providers simultaneously; and
- multiple patient handoffs between care providers.

The following guidance is offered to support perioperative registered nurses in the provision of safe perioperative patient care.

Guidance Statement

Health care organizations should identify in policy which people and/or job categories may participate in medication management and administration. Facility policy for safe medication practice should be based on the five "rights" of medication administration:

- the right patient,
- the right medication,
- the right dose,
- the right time, and
- the right route.

The five rights of safe medication practices should be a final check before the administration of any medication.

Health care organizations should develop standardized procedures for safe medication practices in the OR designed to include, but not be limited to, the following.

- Ensure proper patient identification.
- Document all patient medications.
- Assess for medication contraindications.
- Confirm weight-based dosing before administration.
- Establish dose limits.
- Minimize use of verbal orders to the extent possible.
- Manage medications off the sterile field.
- Deliver medications to the sterile field.
- Manage medications on the sterile field.
- Document all intraoperative medications.
- Monitor and document patient for effects of medications.
- Preserve all original medication/solution containers and delivery devices until the conclusion of the procedure.
- Continually evaluate the medication delivery process for patients within the surgical setting.
- Define procedures for the questioning of any medication order thought to be unclear or inappropriate.[2]

General Risk Reduction Strategies

The following risk reduction strategies offer guidance for the development of policies, procedures, and associated QI and PI monitoring tools and reporting processes related to safe medication handling in the OR. The goal should be to meet or exceed the expectations for safe medication practice as outlined by published national patient safety initiatives (eg, the National Patient Safety Goals of the Joint Commission on Accreditation of Healthcare Organizations [JCAHO], guidelines of the Institute for Safe Medication Practices [ISMP] and USP).

Patient Identification

Minimize the potential for medication error related to incorrect identification of the patient through the establishment of standardized identification processes. Documentation of these processes may provide the necessary data to monitor outcomes for improvement.

- Consider the preoperative checklist as a permanent part of the patient care record.

- Perform patient identification using at least two patient identifiers, neither of which are to be the patient's room number.[3]
- Verification of patient identification should include information from the patient's identification (ID) band(s) or identification record when an ID band is not appropriate.
- Consider using the patient's date of birth as one means of identification (eg, pediatric population).
- Ensure that the contents of patient charts are verified for correct patient information.
- Imprints of patient information (eg, Addressograph stamp) on documents should be legible.
- Standardized forms should have patient identification in the same place on every page; duplexed pages should be identified on both sides in the same place.
- Identify in facility policy which people and/or job categories may participate in medication management and administration.

Accurate Medication List

Provider access to patient-specific information facilitates continuity of care and ensures that essential components for patient care decisions related to the medication management process are available. Readily accessible information should aid in the identification of risk related to medication allergy interaction, contraindication, and medication-medication or herbal-medication interaction. Documentation of this activity is an essential component of outcomes management in regard to patient safety.[4]

- Develop a consistent multidisciplinary approach for documenting the patient's medications using a standardized reconciliation sheet that is readily available for review before the procedure.[3]
- Actively involve the patient or authorized representative in the process of obtaining a complete list of the patient's current medications.[3]

Medication Contraindications

Whenever possible, written medication orders should be reviewed for appropriateness by a pharmacist before dispensing the medication. Concerns and issues related to medication, dose, frequency, route of administration, therapeutic duplication of the medication, its therapeutic class or chemical family, allergies, potential interactions, and contraindications are all elements of the review process.[4,5]

- Existing medication allergy information for each patient must be readily available and communicated to all members of the perioperative team.
- Allergy information may be obtained from patients, family members, legal guardians, and/or prior medical records.
- Health care organizations should provide readily available resources for perioperative personnel to identify medication class, nutrition and herbal supplement interactions (eg, calcium channel blockers and grapefruit) and associated medication class allergies (eg, amoxicillin and keflex).
- An organization-wide process should be in place to cross-reference patient drug allergy interactions, contraindication, and medication-medication/herbal-medication interaction potentials.[3]
  - Patient medications should be validated and cross-referenced during the medication-ordering phase of the medication delivery process.
  - Reference tools such as computer programs or charts should be used.

Accurate Dose Calculation

The patient's weight should be documented in both pounds and kilograms. Both mathematical formats provide a visual cue to eliminate discrepancies and to alert health care personnel to the proper numerical value used in weight calculations. Accurate weight measurement is critical for accurate dose calculation.[4] The medication dose calculation process should include, but is not limited to, the following.

- Accurately obtain weights on all patients before surgery.

- A facility-approved weight conversion chart (ie, pounds to kilograms) should be available for quick reference.
- Redesign patient care forms to clearly reflect weight in both pounds and kilograms.
- If there are discrepancies in weight or dose calculations, the patient should be reevaluated and the weight and dose recalculated.
- Medications ordered using weight-based dose schedules should be independently calculated and verified by two licensed individuals.
- Automate medication dosage calculations whenever possible.

Dose Limits

Health care organizations should identify high-risk and high-alert medications within the organization and develop processes to safeguard against error. Medications with narrow therapeutic ranges are considered at risk for error. Creating conversion charts targeting dose limits for high-risk medications will contribute to their safe use in surgery.[4]

- Dosage conversion charts or electronic aids should be used to calculate maximum dose limits, especially for high-alert medications.
- Separate weight-based conversion charts for children and adults should be developed for each of the major error-prone medications identified for that population at risk.

Verbal Orders

Verification of critical components of perioperative verbal orders, before the implementation of the order, affords an opportunity to confirm the accuracy of the verbal order.[3] Use of verbal and telephone orders should be limited.[2] When verbal orders are necessary, provide mechanisms to ensure accuracy, such as

- record the order in the patient's record according to facility policy as soon as feasible;[2,6]
- perform a "read-back" of the written order;[2,6]
- verbalize the read-back digit-by-digit (eg, say "one-two," not "twelve");[2,6] and
- allow only licensed health care providers to receive verbal orders.

Managing Medications off the Sterile Field

Medications should be properly stored to ensure a process for safe and efficient delivery to the patient. Several key issues to consider are environmental conditions for storing medications to ensure product stability, look-alike and sound-alike medication storage, modification of the standard alphabetical medication storage system, and the care and handling of medical gases, reagents, and chemicals to eliminate catastrophic mistakes.4

- Standardize and limit the variation of strengths and concentrations of medications as much as possible.[3,4]
- Store medications safely with consideration given to separation of look-alikes and sound-alikes. This includes separating by generic name and packaging to the extent possible.[3,4,7]
- Limit the use of multidose vials whenever possible.[4,8,9]
- Include the facility pharmacist in formulating processes to determine when or if unused and unopened medications are allowed to be returned to the pharmacy.[4]
- Do not store medications alphabetically.[4]
- Label storage areas with both the medication's generic and brand names.
- Verify medication labels after medication retrieval and reconfirm with the written medication order.
- Label all medications, medication containers, and other solutions off the sterile field even if only one medication is involved.[3]
- At shift change or upon staff relief, all medications, medication labels, and the amount of medication administered should be verified concurrently by entering and exiting personnel.
- Discard any unlabeled solution or medication found in the OR.

- Treat medical gases, chemicals, and reagents (eg, formalin, normal saline, Lugol's solution, radiopaque dyes, glutaraldehyde) in the OR with the same care and caution as medications.

Delivering Medications to the Sterile Field

Before administering any medication, a verification process should include a review of the product label for the medication name, strength, and expiration date. This review process should be accomplished in conjunction with an examination of the written medication order to confirm that the correct medication is to be administered. A visual inspection should be made for any indication that the medication was compromised during the storage process (eg, particulates, discoloration).[4]

- Confirm all medications listed on the physician's preference list with the surgeon before delivery to the sterile field.
- Orders with abbreviations, symbols, or acronyms should be clarified with the ordering clinician to minimize confusion or misinterpretation.
- Verify medication in its original container for the correct name, strength, dosage, and route with the surgeon's preference card or documented verbal order.
- Actively communicate the medication name, strength, dosage, and expiration date as the medication is passed to the sterile field. [4]
  - Verbally and visually confirm all medications delivered to the sterile field, including medication name, strength, dosage, and expiration date. [4]
  - Medications should be verified concurrently by the circulating registered nurse and scrub person.
  - If there is no designated scrub person, the circulating registered nurse should confirm the medication visually and verbally with the licensed professional performing the surgical procedure.
- Deliver one medication at a time onto the sterile field.
- Do not remove stoppers from vials for the purpose of pouring medications.
- Use commercially available sterile transfer devices when possible (eg, sterile vial spike, filter straw, plastic catheter).
- Reconfirm maximum dose limits.

Managing Medications on the Sterile Field

Communication is a vital key to the success of the medication delivery process.

- Verbally and visually confirm the medication (ie, medication name, strength, dosage, and expiration date) upon receipt from the circulating registered nurse even if only one medication is involved. [4]
- Label the medication container on the sterile field immediately before receipt of the medication. Avoid distractions and interruptions during the labeling process and while dispensing medications onto the sterile field.
- Label all medication containers and delivery devices with a minimum of the medication name, strength, and concentration when needed.[6]
- Verbally and visually confirm the medication name, strength, and dose by reading the medication label aloud while passing a medication to the licensed professional performing the procedure. [4]
- When patient hand-offs (eg, personnel relief) occur, the medication verification process should take place. The medication should be confirmed for accuracy (ie, product label reviewed for the medication name, strength, and expiration date) in conjunction with a review of the written medication order to validate that the correct medication is on the field.[3]
- Discard any solution or medication found on or off the sterile field without an identification label.

Documenting All Intraoperative Medications

A complete and accurate accounting of the medications and solutions used during the surgical encounter is essential to address medication-related issues that may arise during all phases of perioperative care.[4]

- Ensure that intraoperative documentation reflects all medications (including irrigation solutions, doses, and routes of administration) administered throughout the procedure.
- Document medication administration per organizational policy.
- Documentation should incorporate the Perioperative Nursing Data Set (PNDS). The expected outcome for safe medication practices is outcome O9, "The patient receives appropriate medication(s), safely administered during the perioperative period." This outcome falls within the domain of Safety (D1). The associated nursing diagnoses may include X29, "Risk for injury." The associated interventions leading to the desired outcome include I123, "Verifies allergies"; I8, "Administers prescribed medications and solutions"; and I51, "Evaluates response to medications."[10(p103-104)]

Monitoring Patients for Effects of Medications

Assessment and documentation of the patient's response to medication administration provides vital clues related to dose effectiveness and the presence of a potential medication-related adverse effect.[4]

- Continually assess, monitor, and document the patient's response to medication administered.[4,10(p104)]
- Policies and procedures should be developed for reporting and responding to medication errors and other adverse effects.
- Error reporting should occur in a nonpunitive culture.[3]

Retaining All Original Medication/Solution Containers and Delivery Devices

The practice of maintaining possession of medication containers and delivery devices until the patient leaves the OR is important in the event of a medication-related error or adverse reaction. A root cause analysis should be performed following any adverse event. Maintaining possession of these containers may facilitate the analysis.

Periodic Evaluation of the Medication Management Process

An essential step in the medication management process includes ongoing review. An established QI/PI program may identify failure points contributing to medication errors and may aid in improvements in patient safety.

- The QI/PI program should include a routine review and update of all preprinted order sheets, and facility-approved standing orders, including
  - medication choice;
  - dose; and
  - delivery method.
- Eliminate or minimize the use of problem-prone abbreviations, symbols, and acronyms.[11-13]

Additional Strategies for Medication Safety

- Operationalize a process for the ongoing review of key elements of the medication delivery process known to contribute to medication errors, to include
  - prescribing,
  - order processing,
  - dispensing,
  - administration, and
  - monitoring.[14]
- Provide OR personnel with appropriate and timely education related to medication safety procedures. Facilities should implement processes for validating perioperative medication competency covering all age-specific populations (eg, perioperative medication competencies in "AORN's safe medication administration tool kit").[15]

- Use a competency checklist focused on the medication delivery process (eg, perioperative medication performance validation record in "AORN's safe medication administration tool kit").[15]
- Establish outcomes, standards, and guidelines to monitor and manage institutional improvements in regard to medication safety, to include
  - the patient receives appropriate prescribed medication(s) safely administered during the perioperative period;[10(p103)]
  - the patient demonstrates knowledge of medication management;[10(p179)] and
  - the patient demonstrates knowledge of pain management.[10(p179)]
- Modify work schedule requirements in surgical settings to minimize fatigue-induced errors.
- Provide adequate lighting in dark environments (eg, endoscopy, minimally invasive procedures, ophthalmic procedures).
- Initiate constraints and/or forcing functions to minimize risks related to medication management and administration.
  - Constraints are approaches that make a medication error difficult. Examples include dose limit protocols, automatic stop orders, triple-checking medications, and labeling all medication containers in the OR.
  - Forcing functions are approaches that make a medication error impossible. Examples include removing certain medications (eg, cytotoxic agents, concentrations of saline higher than 0.9%) from the OR.[3,16]
- Adopt guidelines for unapproved abbreviations, acronyms, and symbols outlined in national patient safety initiatives.[11-13]
  - Care must be taken to decrease the risk for error and maximize patient safety by avoiding error-prone abbreviations and symbols known to cause confusion or lead to misinterpretation. Examples:
    - Use of the handwritten letter "U" for "units" can be mistaken for a zero.[11-13]
    - Zeros in combination with decimal points can lead to a 10-fold dosing error when the decimal point is not detected.[16]
  - A supplemental list or poster placed in the workplace outlining common abbreviation mistakes may help to focus attention on high-risk avoidance.[17]
  - Recommendations and guidance provided by the ISMP "List of error-prone abbreviations, symbols, and dose designations"; the USP "Potentially dangerous abbreviations"; and the JCAHO "Official 'do not use' list" should be considered.
- Ensure that current and reliable medication reference materials with age-specific guidelines are readily available to the perioperative team.
- Provide pharmacy support for consultation regarding unusual medications and dosages.
- Standardize institutional forms to aid communication and decrease confusion while enhancing productivity between health care providers.[3]

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