Medication Errors: Preventing – General Principles

What are the General Principles in Preventing Medication Errors?

› The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines a medication error as “any preventable event that can cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events can be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use” (NCC MERP, n.d.). Medication errors are often preventable; by adhering to safe medication practices, nurses are at the frontline in preventing potentially serious errors.

• What: Medication errors can occur in any of the four steps of the medication use process: Prescribing, transcribing, dispensing, and administering. Errors that do not result in harm are termed “incidents,” while errors that do result in patient harm or injury are referred to as “adverse drug events” (ADEs).

– Medication errors can involve:
  - prescribing, transcribing, dispensing, or administering
  - errors that occur during medication preparation and administration, often due to nurse interruption or distraction
  - confusing look-alike/sound-alike (LASA) medications (i.e., medications that have names that look similar or sound similar; e.g., dopamine and dobutamine, azathioprine and azacitidine, amantadine and amiodarone)
  - nurse failure to verify the 6 “rights” of medication administration (i.e., right patient, right medication, right dose, right time, right route, right documentation)
  - Documentation is considered the 6th right of medication administration
  - failure to properly document medication administration or the reason for omitting a medication
  - failure to administer a prescribed medication
  - inadequate communication regarding the patient’s medication needs (e.g., lack of medication reconciliation)
  - inadequate patient monitoring following drug administration

• How: As clinicians routinely involved in medication administration, nurses constitute a safety net in the prevention of medication errors. When administering any medication, nurses must verify the 6 “rights” of safe medication administration (Figure 1).

Additional rights to consider include right reason, right response, right to refuse, and right to be educated (Figure 2). Preventing errors in the administration of medication also requires adherence to infection control protocols, knowledge of the medication indications and pharmacokinetics, patient monitoring for the desired effect and any adverse effects of the medication, and knowledge of how to treat unexpected outcomes. For more detailed information about preventing medication errors based on medication type and/or patient care setting, see other literature in the Nursing Practice & Skill series on prevention of medication errors.
Where: Safe medication practices to prevent errors are implemented in all patient care settings, including hospitals, nursing homes and other long-term care facilities, outpatient clinics and surgery centers, and home care settings

Who: Although medication orders are written by physicians and other advanced practice clinicians, nurses are principally responsible for reviewing the orders; verifying the correct patient, dose, route, and concentration; administering the medication correctly and on time; and providing follow-up patient assessment and monitoring. Tasks to prevent medication errors should not be delegated to assistive healthcare personnel

What is the Desired Outcome of Preventing Medication Errors?

- The primary goal of preventing medication errors is to promote patient safety. In addition, preventing medication errors
  - facilitates optimal management of patient disease states
  - helps control healthcare costs
  - promotes earlier patient discharge
  - increases patients’ satisfaction with their care

Why is Preventing Medication Errors Important?

- Preventing medication errors is important because of the tremendous impact these errors can have on patients, healthcare organizations, and the healthcare system
  - The annual economic cost of medication errors in the U.S. is an estimated 136 billion dollars (Gopalan, 2017)
Increasing public awareness of adverse medication events can create fear among consumers and dissatisfaction with the healthcare system, making some family members hesitant to leave their loved ones alone in the hospital. Preventing medication errors can avert negative outcomes, including:

- interruption in the delivery of potentially life-saving medications
- increased patient morbidity
- increased healthcare costs
- prolonged hospitalizations
- decreased patient satisfaction and increased consumer fear

**life-threatening adverse events or death**

- potentially devastating professional and personal consequences (e.g., removal of licensure, shame, guilt, criminal liability) for nurses and treating clinicians

Reporting medication errors is an important measure to prevent future medication adverse events in the healthcare system.

**Facts and Figures**

The Joint Commission (TJC) developed National Patient Safety Goals (NPSGs) to promote patient safety in acute care facilities. Several of TJC’s NPSGs promote medication safety, including the need to label medications and solutions when performing procedures (NPSG.03.04.01), safely manage anticoagulants (NPSG.03.05.01), and reconcile medications (i.e., compile a list of all the patient’s current medications); (NPSG.03.06.01); (TJC, 2018).

Michael Daniel, the author of a study done by researchers at Johns Hopkins hospital in 2016, found that more than 250,000 deaths every year are due to ADEs. This places medical errors as the third leading cause of death in the U.S (Daniel, 2016).

Nurses need system-wide support to safely administer medication with a high moral awareness. This can be done by providing nurses with a good work environment and encourage them to work collectively (Härkänen et al., 2017).

Almost 700,000 ED visits and 100,000 hospitalizations are due to ADEs each year. An ADE is one of the most common types of inpatient errors, with 5% of hospitalized patients experiencing at least one ADE (Agency for Healthcare Research and Quality, 2017).

Elderly patients and children are specifically vulnerable to experiencing ADEs; many older adults have polypharmacy and are more susceptible to adverse effects than younger adults. Pediatric patients are also vulnerable to ADEs because many medications for children are dosed according to their weight, and dosing errors can occur if the child’s weight is either unknown or inaccurate (Agency for Healthcare Research and Quality, 2017).

Medical errors are reduced when nurses effectively:

- maintain medication safety, such as
  - educating patients
  - taking all patient factors into consideration when administering medication (e.g., lab values, patient weight, diagnosis, patient age, vital signs, gender, allergies, drug interactions)
  - advocating for patients with the pharmacy (e.g., scheduled delivery of medication)
  - coordinating care with physicians (e.g., teamwork, update on patient status changes)
  - conducting independent medication reconciliation (e.g., comparing the physician order with the medication administration record [MAR] during change of shift)
  - verifying with colleagues (e.g., calculating drug dosages independently and then together)

- manage the work environment, such as
  - coping with interruptions and distractions (e.g., finding a quiet area during medication preparation or implementing a hospital-wide policy with the nurses wearing a red vest implying, “I am passing meds, please do not interrupt”)
  - interpreting/clarifying physician’s orders (e.g., confirming illegible handwritten orders)
  - documenting near misses
  - encouraging open communication between disciplines, including ancillary staff, and colleagues

- identify risk factors that contribute to medication errors by visiting nursing staff in residential homes, which include:
  - Environmental distractions (e.g., noise, lighting, interruptions)
  - Lack of education about the patient
  - Polypharmacy, which can lead to confusion over dosage and frequency
  - Inadequate knowledge about medications
  - Deficient medication review
  - Prescribing errors
  - Restricted access to prescribing clinician
Patient factors (e.g., dementia, confusion) • have awareness that common medication errors include medication that is given
  to the wrong patient
  twice
  at the wrong time or by the wrong route
  at the wrong dose or infusion rate

What You Need to Know Before Preventing Medication Errors
› Factors that contribute to an increased risk for medication errors in general include
  • prescriber errors, which can include
    – failure to distinguish between LASA medications resulting in potentially deadly medication errors
    - LASA-related medication errors often involve generic and brand names and are among the most common medication errors worldwide; the generic name for a medication can be confused with the generic name of a different medication or with the brand name of a different medication
    - The U.S. FDA collaborated with drug manufacturers to accentuate differences in the names of LASA medications by capitalizing certain unique letter clusters (referred to as tall man letters; e.g., dopamine is written DOPamine and dobutamine is written DOBUTamine) to help prevent confusion regarding the name. The FDA-approved and the Institute for Safe Medication Practices (ISMP) recommended list of LASA medications that are assigned tall man letters can be accessed at https://www.ismp.org/recommendations/confused-drug-names-list
    - The NCC MERP recommends including a brief notation of purpose (e.g., for cough) on prescription orders, unless considered inappropriate by the prescriber (e.g., to maintain confidentiality), as an additional safety check
  – illegible handwriting
  – use of medical abbreviations (e.g., mg, mcg, mL) instead of writing out the measurement unit (e.g., milligrams, micrograms, milliliters)
  – failing to use decimal points correctly, which can result in tenfold dosing errors
  – off-label prescribing
  – unnecessary use and poor documentation of verbal/telephone orders
    - Verbal/telephone orders occur more frequently than is necessary on acute care units, and are associated with greatly increased risk for error, patient injury, or death
  • calculation errors, which can occur due to
    – confusing pounds with kilograms
    – confusing mg/kg/dose with mg/kg/day and vice versa
    – failing to perform two-person verification of calculations. (For more information, see Evidence-Based Care Sheet: Medication Errors: Double-Checking
    - Two-person verification of medication calculation is particularly important when administering high-alert medications (i.e., medications that have an increased risk of patient harm if they are administered in error; e.g., insulin).
    - Unit-specific/facility protocols should be followed to protect the safety of patients when administering high-alert medications. The ISMP has compiled a list of high-alert medications that can be accessed at https://www.ismp.org/recommendations/high-alert-medications-acute-list
  • lack of standardized order sets, which reduce the number of errors made by prescribers and dispensing pharmacists
  • failure to perform medication reconciliation, including over-the-counter (OTC) medications, which can place the patient at risk for drug interactions and overdose
  • dispensing errors, including preparing the wrong formulation
  • inadequate staffing
  • administration errors, which can be the result of
    – failure to verify the 6 “rights” of safe medication administration
    – nurse fatigue
    – frequent interruptions and distractions
    - Nurse interruptions are being increasingly recognized as one of the most significant risks for medication errors. (For more information, see Evidence-Based Care Sheet: Medication Errors: Distraction and Interruptions)
  › In addition to adhering to the 6 “rights,” before administering a medication the nurse should be familiar with
    • the drug’s mechanism of action, potential adverse effects, and contraindications
    • facility/unit specific protocols for patient monitoring and treatment for complications
• any necessary drug calculations
• established standards for the medication delivery process from the pharmacy, per facility protocol
• the policy on accepting and documenting verbal orders, per facility protocol
• the correct use of PRN (as needed) medication orders
• medications that have automatic stop dates set by facility policy (e.g., antibiotics) and/or controlled substances (e.g., opioids) that have automatic stop dates mandated by law

› Nurses should have access to
  • the list of medication-related abbreviations prohibited by TJC; for more information go to https://www.jointcommission.org/facts_about_do_not_use_list/
  • the U.S. FDA and ISMP list of look-alike drug names and recommended tall man (mixed case) lettering, which is accessible at https://www.ismp.org/recommendations/tall-man-letters-list

The Institute of Medicine (IOM) recommends establishing and maintaining strong provider-patient relationships and empowering patients to be proactive in their health care as ways to reduce and prevent medication errors. Nurses play an important role in recognizing and managing patient-related factors that can contribute to suboptimal healthcare delivery, such as
• health illiteracy
• cultural barriers
• language barriers

› Preliminary steps that should be performed before undertaking efforts to prevent medication errors in any healthcare setting include:
  • Review facility/unit specific protocols, if available, for
    – patient identification
    – medication administration
    – use of medical abbreviations
    – the procedure for taking verbal/telephone orders
    – use of medication reconciliation records
    – administration of high-alert medications
    – use of tall man letters
    – reporting medication errors
  • Gather supplies necessary for the safe administration of medications (for more information, see the series of Nursing Practice & Skill papers regarding medication administration). In addition to the standard supplies necessary, gather the following supplies to enhance patient safety:
    • Drug reference
    • Calculator
    • MAR
    • Treating clinician’s order sheet

How to Prevent Medication Errors

› Advocate for systems changes that promote
  • adequate staffing of nurses
  • reduction in nurse interruptions during medication preparation and administration
  • increased use of medication reconciliation records at admission and discharge
  • limiting use of verbal/telephone orders to emergent situations
  • adequate control of high-alert medications, e.g.,
    – by storing these medications in an automated dispenser that requires sign-in by two nurses
    – by instituting a system of double-checks, in which two nurses independently check the order (for more information, see Evidence-Based Care Sheet: Medication Errors: Double-Checking )
  • use of tall man letters (see What You Need to Know Before Preventing Medication Errors, above)
    – A list of recommended tall man letters specific to the medications most commonly prescribed on the unit can be developed and posted prominently where medication orders are typically written
  • eliminating the use of medical abbreviations on medication orders
    – A list of “do not use” abbreviations can be developed and posted prominently where medication orders are typically written
independent verification of medication orders by pharmacists
- standardized order sets
- use of computerized physician order entry systems with clinical decision support
- use of bar code scanning systems (i.e., systems that scan a bar code on the patient’s identification bracelet and verify that it matches the bar code on the MAR and on the prepared medication). For more information, see Evidence-Based Care Sheet: Medication Errors: Bar-Coded Medication Administration

If it becomes necessary to take a verbal or telephone order, utilize a “read-back” system, which can be accomplished by the following:
- Retrieve the prescriber’s order sheet before taking the order
- Record the medication order on the order sheet while it is being verbally dictated by the prescriber
- Read the complete order back to the prescriber including the
  – patient’s name
  – medication name
  – medication dose
  – medication time and frequency (e.g., every 8 hours)
  – medication route and IV infusion rate, as appropriate
- Document the prescriber’s name and sign the entry with your own full name and credentials
- Flag the order, per facility protocol, to alert the prescriber to sign the verbal order

Clarify medication orders with the prescriber and/or a licensed pharmacist or by consulting a drug resource guide if a question or concern exists
- Verify that the medication order includes
  – the patient’s name
  – date and time the medication order was written
  – a diagnosis, condition, or indication for the medication
  – the medication name (using tall man letters when appropriate), dosage (with units written out rather than abbreviated), the route of administration, the frequency of administration (e.g., “times one” or “every 8 hours” rather than “three times/day”), the time to be administered (e.g., STAT, one hour before the procedure), and the signature of the prescriber
- Ask for clarification or ask the prescriber to rewrite the medication order if the prescriber’s handwriting is illegible, medical abbreviations are used, or the units of measurement are unclear

Consult the patient’s medical record to
- verify that the patient does not have a known allergy to the prescribed medication
- confirm that the patient’s most recent weight is provided to allow for accurate weight-based dose calculations
- verify that there are no contraindications to administering the medication (e.g., bradycardia, hypotension, oliguria)
- verify that there are no adverse interactions among prescribed-, traditional-, and over-the-counter (OTC) medications that the patient is taking

Compare the medication with the treating clinician’s order and the patient’s MAR
- Begin at the top of the MAR and check each medication in order against the medication packages
- Check the patient’s daily MAR with the previous day’s MAR every 24 hours for medication dose, route, and time
  – New or altered medications and/or discontinued medications must be identified and verified with the treating clinician’s orders
  – Verify that the MAR is consistent with the treating clinician’s most recent order for each medication
- Identify any unfamiliar medications and verify an understanding of the following before administration:
  – Generic and trade name
  – Drug classification and major uses
  – Pharmacologic actions
  – Safe dose, route, and time of administration
  – Adverse reactions
  – Nursing implications
    - If any questions arise regarding the medication, contact the pharmacist on duty before the medication is administered

Promote patient safety during medication preparation and administration by
- focusing the process of medication administration and asking colleagues to avoid interrupting during the medication preparation, administering, and documenting process
- preparing medications for one patient at a time
• reviewing the 6 “rights” of safe medication administration and administering the medication as ordered

› Prepare the medication for administration
• Compare the drug label with the MAR
• Inspect the label for the expiration date and verify the medication is indicated for the ordered route of administration
  – If the medication is to be administered IV, confirm medication compatibility with the primary IV solution; if the solution is incompatible with the medication, replace the solution with a compatible solution
• If any calculations are required to prepare the ordered dose,
  – verify units of measurement
  – calculate the medication dose based on the strength of the medication, if indicated
  – confirm calculation with another nurse, according to facility protocol, to double check the calculation; check if your facility requires two signatures by licensed nursing staff for recording medication calculations in the MAR
• If any discrepancies are noted or if you are unclear about the medication order or any other factor in the medication administration process (e.g., the label on the medication is unclear), DO NOT ADMINISTER THE MEDICATION. Instead, follow the established protocol at your facility to report your concern and initiate any necessary clarification/revision. Only administer the medication once all safety concerns have been addressed

› Following administration of medication:
• Observe the patient for the development of side effects and for signs of allergic reaction to the medication
• Closely monitor the patient’s vital signs, pain level, and level of consciousness according to facility/unit specific protocol
• Monitor for phlebitis, extravasation, thrombosis, occlusion, vein irritation, pain, and catheter dislodgement, and implement nursing interventions, as appropriate
• Monitor for the intended clinical response to the medication
• Report any abnormal patient assessment findings to the treating clinician and provide prescribed treatment

› Discard used procedure materials and PPE according to facility protocol
› Perform hand hygiene
› Update the patient’s plan of care, if appropriate, make the appropriate notation in the MAR, and document medication administration in the patient’s medical record, including the following information:
  • Date and time of the medication administration
  • Drug calculation, if applicable
  • Medication preparation, route, and dose
  • Assessment findings, including
    – vital signs
    – level of pain
    – assessment of IV site
  • Patient’s response to the procedure, including pain or discomfort during and immediately following the administration of medication
  • Any unexpected patient events or outcomes, interventions performed, and whether the treating clinician was notified
  • Patient/family member education, including topics presented, response to education provided or discussed, plan for follow-up education, and details regarding any barriers to communication, and techniques that promoted successful communication

Other Tests, Treatments, or Procedures That Can be Necessary Before or After Taking Measures to Prevent Medication Errors

› If a medication error occurs, the patient must be closely monitored for adverse effects and the treating clinician immediately notified
› Immediately report all medication errors to the unit administrator and facility’s risk management department; to prompt an investigation into the cause of the error, and improve the safety of medication delivery
› Specific laboratory tests can be required to monitor medication efficacy (e.g., peak and trough levels for vancomycin administration)
› Encourage staff communication and leadership by collaborating with colleagues, administrators, nurse educators, pharmacy, and the facility’s risk management department to identify and implement policies and procedures to reduce medication errors
  • Promote the use of standardized prescribing vocabulary and avoid the use of abbreviations
  • Promote implementing a standard process for IV therapy and the infusion of medication including the timing and dosing scales
Encourage the development and transformation of your facility’s technology team to stay abreast of new devices proven to decrease medication errors and to promote equipment education and compliance.

Foster and maintain a non-punitive environment on the unit and in the facility to promote reporting of medication errors and near-miss episodes (i.e., a situation that could have resulted in a medication error, but did not).

Collaborate with colleagues, administrators, staff educators, pharmacy clinicians, and members of the facility’s risk management department, to promote a culture of safety and to identify and implement policies and procedures to reduce medication errors in the critical care setting.

What to Expect After Taking Measures to Prevent Medication Errors

The right medication is administered as prescribed to the right patient, in the right dose, at the right time, and by the right route; medication errors are avoided, and the medication has the intended effect.

Documentation of the medication is accurate in the MAR.

Patient monitoring is provided to evaluate the effects of the medication and to identify and respond to complications should they arise.

Red Flags

Delay in the administration of a medication or a missed dose, are medication errors that can result in potentially serious consequences for the patient in a critical care setting.

Older adults generally consume more medications than other patient populations and are at a higher risk for medication errors.

Persons who are mentally incapacitated and/or critically ill might not be able to effectively communicate symptoms of adverse medication effects.

Oral medications should be avoided if the patient’s status is N.P.O.; clarify the order with the treating clinician.

There is an increased risk for medication errors with use of anticoagulants, diuretics, hormones, corticosteroids, opiates, antibiotics, antidepressants, and cardiovascular medications.

What Do I Need to Tell the Patient/Patient’s Family?

Educate the patient/family about what to expect during and after the administration of medication and explain that the medication is intended to have. Encourage and answer questions.

Educate the patient/family on potential adverse effects of medications, associated risks, and the plan of care if adverse effects arise.

Educate the patient/family that OTC medications can interact with prescription medications and encourage the patient to openly communicate about all medications.

Continually assess the patient (and spouse/partner, if present) for knowledge deficits and anxiety related to the prescribed medication; educate and provide reassurance about patient health and nursing interventions, as applicable.

References


