Nebulized Medication Administration Errors

Nebulizers are an effective way to deliver medication and work by changing liquid drugs into mist form which can then be inhaled. Patients can easily breath in the mist with normal inspiration as opposed to using metered dose inhalers which require coordinated breaths. Medications delivered in this way have a rapid onset and minimal systemic effects. Nebulized medications can be used with a mouthpiece, face mask, tracheostomy collar, T piece, or ventilator circuit.

While easy to deliver medications via a nebulizer, a variety of errors may occur.

- Omitted medication is the most common mistake and happens when:
  - Respiratory therapy staff are not aware of the prescribed treatment.
  - Respiratory staff are unavailable to administer the treatment (i.e. busy caring for a critical patient).
  - Respiratory staff incorrectly believe the patient did not need the treatment.
  - Prescribed treatment is not electronically transmitted or transcribed properly to a respiratory task list.
  - Respiratory staff are not notified of a new order.
  - Orders are miscommunicated between respiratory staff.
- Mix-Ups between look-alike plastic medication vials.
  - Nebulizer medications are colorless solutions packaged in clear, unit-dose plastic vials.
  - Plastic vials for various medications come in similar shapes and sizes.
  - Drug name and strength are often embossed on the vials, which are difficult to read.
  - Mix-ups have occurred between drugs such as albuterol and the combination product ipratropium with albuterol; dornase alfa and tobramycin; and 3% and 7% hypertonic saline.
  - Different forms of drugs may be supplied in similar plastic vials (i.e. cromolyn solution is distributed as an oral form (40 mg in 20 mL) as well as an inhalation solution (20 mg in 20 mL) which can easily be confused.
  - Ophthalmic products (artificial tears) and pediatric oral solutions are also packaged in plastic vials with embossed labeling.
  - Errors occur when plastic vials have been removed from the carton or foil pouch and/or intermixed with other nebulizer medications in the same storage bin or in automated dispensing cabinets (ADCs).
- Other look-alike containers.
  - Normal saline and sterile water are used as diluents for some nebulizer treatments. Other medications stored in similar-looking containers and left at the bedside have been mistakenly used.
- Overriding warnings from ADC machines.
  - Obtaining nebulizer medications via override from an ADC has been linked to several wrong drug, strength, or form errors and wrong patient errors.
- Barcode scanning not used.

References

1. Institute for Safe Medication Practices. (2018). *Nurse Advise-ERR.* Retrieved from Institute for Safe Medication Practices: http://www.ismp.org/newsletters/nursing/issues/NurseAdviseERR201805.pdf

    - Some nebulizer medications and solutions are packaged in multipacks where a barcode is located on the outer carton or inner foil and not on the individual unit vial.
    - Even if a pharmacy-applied barcode is present, nurses and RTs may bypass the scanning process before administering nebulized medications and thus are not documented on the electronic medication administration record (eMAR); a duplicate dose may be incorrectly administered.
- Route of administration confusion.
    - Some medications are prescribed off-label via nebulization such as nebulized heparin to treat pulmonary coagulopathy and inflammation in patients with acute lung injury; the nebulized heparin has been incorrectly given subcutaneously and vice versa.
- Equipment Errors.
    - Forgetting to start or plug in the nebulizer.
    - Not using a filter when transferring methacholine (bronchoconstrictor used to diagnose asthma) from the vial to the nebulizer could cause the ventilator circuit to malfunction.

The following recommendations may help reduce errors when administering nebulized medications:

- **I**mplement a system to **communicate** new and changed orders for nebulized medications to respiratory therapy staff. Test the system, ensure reliability and assess failures in the process.
- **Promote collaboration** between nursing and respiratory staff to assess whether a dose of nebulized medication should not be given based on patient status. Define conditions in which the prescriber should be notified when a nebulizer treatment is held.
- Mandate that staff **document and communicate the reason for holding** nebulized treatments during change of shift report. Clarify unclear or inappropriate hold orders. Reassess patients who may have had one or more doses held during a shift. Make sure all documentation is on the same eMAR.
- Assess respiratory therapy **staffing patterns** to ensure adequate coverage to provide all necessary nebulized treatments. Implement an emergency coverage back-up plan and communicate the plan to nursing staff.
- **Store plastic vials in the original carton or foil pouch** since plastic vials look similar and the embossed labeling is difficult to read. Do not use auxiliary labels or ink directly on plastic vials as these may leach into the plastic and medication.
- Vials should be **stored separately** in ADC pockets with lids. Utilize barcode scanning to stock the ADC. If refrigeration is required, ensure the box is closed to prevent medication mix-ups.
- **Withdraw nebulizer medication** from glass or ampul containers **immediately before use**. If the medication must be withdrawn into a syringe in advance, label the syringe with the drug name, strength, time, date and a warning that the medication is for nebulization only.
- **Do not remove** nebulized drugs **from ACD via override**, except in an emergency. Request a double check by another practitioner if a drug is removed via override during an emergency. Check all overrides for compliance.
- **Do not store non-diluent solutions**, such as acetic acid and other clear solutions that should not be used for dilution, **near the nebulizer** to prevent potential mix-ups.

References

1. Institute for Safe Medication Practices. (2018). *Nurse Advise-ERR.* Retrieved from Institute for Safe Medication Practices: http://www.ismp.org/newsletters/nursing/issues/NurseAdviseERR201805.pdf

- Make **barcoding a requirement** and ensure nurses and respiratory therapists use the barcode scanning system before administering each nebulized medication. When possible, use products that are individually barcoded by the manufacturer, or apply a barcode label to the tab of individual plastic vials.
- **Apply auxiliary labels** to foil pouches or cartons to delineate different strengths of nebulizer hypertonic and normal saline solutions. For off-label nebulized medications, apply a warning label to emphasize the right route of administration. Include instructions on methacholine label to use a sterile bacterial retentive filter when transferring from the vial to a nebulizer cup.

References

1. Institute for Safe Medication Practices. (2018). *Nurse Advise-ERR.* Retrieved from Institute for Safe Medication Practices: http://www.ismp.org/newsletters/nursing/issues/NurseAdviseERR201805.pdf