Verification of Feeding Tube Placement
(blindly inserted)

Expected Practice:
- Use a variety of bedside methods to predict tube location *during* the insertion procedure:
  - Observe for signs of respiratory distress.
  - Use capnography if available.
  - Measure pH of aspirate from tube if pH-strips are available.
  - Observe visual characteristics of aspirate from the tube.
  - Recognize that auscultatory (air bolus) and water bubbling methods are unreliable. [Level B]
- Obtain radiographic confirmation of correct placement of any blindly inserted tube prior to its initial use for feedings or medication administration.
  - The radiograph should visualize the entire course of the feeding tube in the gastrointestinal tract and should be read by a radiologist to avoid errors in interpretation. Mark and document the tube’s exit site from the nose or mouth immediately after radiographic confirmation of correct tube placement. [Level A]
- Check tube location at 4-hour intervals after feedings are started:
  - Observe for a change in length of the external portion of the feeding tube (as determined by movement of the marked portion of the tube).
  - Review routine chest and abdominal x-ray reports to look for notations about tube location.
  - Observe changes in volume of aspirate from feeding tube.
  - If pH strips are available, measure pH of feeding tube aspirates if feedings are interrupted for more than a few hours.
  - Observe the appearance of feeding tube aspirates if feedings are interrupted for more than a few hours.
  - Obtain an x-ray to confirm tube position if there is doubt about the tube’s location. [Level B]

Scope and Impact of the Problem:
Although often considered an innocuous procedure, blind placement of a feeding tube can cause serious and even fatal complications. While styleted small-bore tubes are most often associated with complications, large-bore unstyled tubes are not without risk. In a review of over 2,000 feeding tube insertions, investigations found that nasogastric feeding tubes were malpositioned in 1.3 to 3.2 percent of all insertions; further, 28 percent of the malpositions resulted in pneumonia or pneumothorax. Although rare, feeding tubes may be malpositioned in the brain, especially in patients with a traumatic defect. Risk for aspiration is greatly increased when a feeding tube’s ports end in the esophagus.

Supporting Evidence:
**Bedside Methods to Determine Placement During Blind Tube Insertion**

**Signs of Respiratory Distress**
- Symptoms such as coughing and dyspnea may occur when feeding tubes are inadvertently positioned in the airway, especially in patients with an impaired level of consciousness. The occurrence of these signs should cause removal of the tube and a new insertion attempt.

**Capnography**
- A carbon dioxide detector is helpful but is not sufficiently sensitive and specific to preclude the need for a confirmatory x-ray before initial use of a feeding tube. In addition a concurrently used CO2 sensor failed to detect 2 of the 4 malpositioned tubes. Also, a carbon dioxide sensor cannot determine where a feeding tube’s tip ends in the gastrointestinal tract (esophagus, stomach, or small bowel).

**pH and Appearance of an Aspirate**
- Fasting gastric pH is usually 5 or less, even in patients receiving gastric-acid inhibitors. Respiratory secretions typically have a pH greater than 6. However, because gastric fluid occasionally has a high pH,
the pH method is not sufficiently reliable to rule out the need for an x-ray to distinguish between gastric and respiratory tube placement.\textsuperscript{26}

- Small bowel secretions typically have higher pH values ($\geq 6$) than gastric juice; thus, observing for pH changes is useful in determining when a feeding tube has advanced from the stomach into the small bowel.\textsuperscript{24,25,27}

Using this method, it is often possible to limit the needed number of confirmatory x-rays to one.

- The pH method has no benefit in detecting placement of a feeding tube in the esophagus. Fluid withdrawn from the esophagus can be swallowed alkaline saliva or refluxed acidic gastric juice.\textsuperscript{28}

- In summary, while the pH method is helpful, it is not sufficiently accurate to eliminate the need for a confirmatory x-ray prior to first-time use of a feeding tube.

- Aspirate appearance is not sufficient to eliminate the need for a confirmatory radiograph prior to first-time use of a feeding tube; there is confusion in differentiating between gastric and respiratory secretions.\textsuperscript{15,37,6,16,30-36}

**Listening over Epigastrium for Air Insufflated Through Tube.**

- The auscultatory method is not reliable in distinguishing between respiratory and gastric placement or between gastric and small bowel placement.

- There are numerous anecdotal reports of blindly-inserted tube entering the respiratory tract undetected by the auscultatory method, causing clinicians to assume that the tubes were correctly positioned in the stomach.\textsuperscript{6,16,30-36} In a number of these cases, feedings or medications were administered and led to poor patient outcomes.\textsuperscript{6,16,35,36,40,42-44}

**Radiographic Confirmation**

- A properly obtained and interpreted radiograph is recommended to confirm correct placement of any blindly inserted tube before its initial use for feedings or medication administration.\textsuperscript{1,9,30,45,46,47} Because radiographs may be misinterpreted,\textsuperscript{42,44,46} it is best to have a radiologist read the film to approve use of the tube for feedings.\textsuperscript{1}

- Marking and documenting the tube’s exit site at the time of radiographic confirmation of correct placement will be helpful in subsequent monitoring of the tube’s location during its use for feedings.\textsuperscript{49}

**Checking Tube Location at Regular Intervals After Feedings are started**

Feeding tube dislocation during feedings is a frequent problem.\textsuperscript{49-51} Most often, it occurs when the tube is partially pulled out during movement or by an agitated patient.

**Observing for Change in External Tube Length.**

- Observing for a change in length of the external portion of the feeding tube (as determined by movement of the marked portion of the tube) may be helpful in detecting tube dislocation.\textsuperscript{49-50}

**Reviewing Routine Chest and Abdominal X-ray Reports.**

- Reviewing routine chest and abdominal x-ray reports to determine if the radiologist has referred to feeding tube location can be quite helpful.\textsuperscript{49}

**Observing For Changes in Volume of Feeding Tube Aspirates.**

- Observing the volume of fluid withdrawn from a tube at 4-hour intervals during continuous feedings or prior to each intermittent feeding may be helpful.\textsuperscript{49} A sharp increase in residual volume may indicate displacement of a small-bowel tube into the stomach.

- Consistent inability to withdraw more than a few drops of fluid from the feeding tube may signal upward displacement into the esophagus.\textsuperscript{28}

- It is often difficult to withdraw fluid from small-bore feeding tubes.\textsuperscript{52} To avoid this problem, a proven method\textsuperscript{53} calls for injecting 20-30 ml boluses of air into the tube with a large syringe (30 ml to 60 ml) and then slowly applying negative pressure to the plunger to withdraw fluid; it may be necessary to repeat the procedure several times.

**Testing pH of Feeding and observe the Appearance of Tube Aspirate if Feedings are Off for Several Hours.**

- While feedings should never be interrupted solely for the purpose of pH testing, or observing the appearance of feeding tube aspirates they are sometimes interrupted in preparation for tests or procedures. If the latter occurs, pH testing may be useful in distinguishing between gastric and small bowel tube positions.\textsuperscript{26,54} The pH method is of minimal benefit during continuous feedings because enteral formula buffers the pH of gastric secretions.\textsuperscript{55} Observing the appearance of feeding aspirates may be useful in distinguishing between gastric and small bowel positions.\textsuperscript{57} As indicated above, fasting gastric juice is usually grassy-green or clear and colorless, while small bowel juice is often bile-stained.\textsuperscript{37}

**Listening Over Epigastrium for Air Insufflated Through the Tube.**

- The auscultatory method cannot distinguish between esophageal, gastric, or small bowel tube placement.

**Obtain an x-ray to determine tube location if in doubt.**

- When multiple bedside methods suggest that tube displacement has occurred, it is prudent to consider obtaining an x-ray to determine tube location.
Actions for Nursing Practice:

- Use a variety of bedside techniques to assess tube placement during the insertion procedure; use results to determine when it is time to obtain radiographic confirmation of tube location. The number of needed confirmatory x-rays can likely be reduced to one.

- Obtain an x-ray that visualizes the entire course of a newly inserted tube to ensure that it is in the desired position (either the stomach or small bowel) before its initial use. Work with an interdisciplinary team to establish a protocol whereby a radiologist will read the film and give written permission for first-time use of the tube for feedings or medication administration.

- Ensure that your critical care unit has written practice documents such as a policy, procedure or standard of care that include when the initial x-ray should be obtained, a method of marking the feeding tube, where to document the exit site, and the frequency of the documentation.

- If documentation of tube placement is not currently a part of the routine interpretation of chest and/or abdominal x-rays, form a collaborative team including a radiologist, pulmonologist, staff nurse, and risk manager to develop strategies for implementing this practice.

- Monitor tube position at 4-hour intervals using a variety of bedside techniques; consider the need for an x-ray if multiple bedside techniques raise doubt about a tube’s location.

Need More Information or Help?

- Go to [www.aacn.org/prtnfo](http://www.aacn.org/prtnfo).

References:


Additional reading
2. Martindale, RG, MD, PhD; McClave, SA MD; et al; American College of Critical Care Medicine; the A.S.P.E.N. Board of Directors Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. Crit Care Med. 2009; 35; 1-30


