



## Training Suggested When Changing Brands of Enteral Feeding Tubes

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### ABSTRACT

A Pennsylvania healthcare facility requested guidance from the Pennsylvania Patient Safety Authority about issues arising from misplacements of small-bore nasogastric feeding tubes after switching to a different brand of an enteral feeding delivery system. The facility wanted to know if other hospitals were experiencing similar types of adverse events. Analysis of events reported to the Authority from January 2011 through October 2013 revealed 44 reports that described misplacements of small-bore nasogastric feeding tubes. It is estimated that more than 1.2 million small-bore feeding tubes are used annually in the United States. Analysis of events reported to the Authority (1) indicates an increase in reports of small-bore nasogastric feeding tube misplacements from January 2013 to October 2013 compared with the previous two years, (2) offers possible explanations for why this increase in malpositions may have occurred, and (3) suggests strategies facilities can take to reduce the risk of experiencing this adverse event, including staff training and combining placement practices. (Pa Patient Saf Advis 2014 Jun;11[2]:78-81.)

### INTRODUCTION

In 2013, a Pennsylvania healthcare facility experienced misplacements of small-bore nasogastric feeding tubes, resulting in harm to their patients. The events occurred after different staff members, with a range of 10 to 15 years of experience in placing tubes, placed the nasogastric feeding tubes. The placements were then verified with radiographic confirmation, which was the established procedure at this facility.

After the second misplacement, an inquiry was made by the healthcare facility's patient safety officer (PSO) to the Pennsylvania Patient Safety Authority's regional patient safety liaison wondering if other Pennsylvania facilities were experiencing similar events. The facility had switched to a different manufacturer's enteral feeding delivery system (i.e., pumps, disposable sets, feeding tubes, kits, and related device accessories) in the first quarter of 2013 because its previous provider had withdrawn from the enteral device market.

Analysis of the events reported to the Authority indicates an increase in the reported events of misplacement. The increase in the number of reports of misplacements may be in part due to differences in the feeding tubes that were not communicated to the staff because of their familiarization with feeding tube placement. Recommendations to prevent such events include staff education and combining placement practices.

### REVIEW OF REPORTS DESCRIBING MISPLACEMENTS

A database query of events reported through to the Pennsylvania Patient Safety Reporting System (PA-PSRS) from January 2011 through October 2013, using keywords such as "feed," "place," "lung," "small-bore," and "pneumothorax," returned 654 reports. Analysis revealed 44 reports that described misplacement events in the lung involving the use of small-bore nasogastric feeding tubes. More than half of the events (n = 24) were classified as Serious Events resulting in harm to patients. See Table 1 for a summary of the events by year and event type.

Examples of feeding tube misplacement events reported to the Authority are as follows:

*A pneumothorax was noted status post [weighted feeding] tube placement. The patient was closely monitored, and a surgical consult was obtained. The patient stabilized without the need for invasive treatment.*

*[A weighted feeding tube] was used and the correct procedure was followed. The [weighted feeding tube] has coursed to wrong destination (bronchus) instead of the intended (stomach/pylorus), as noted during confirmation by chest x-ray. Patient was on close monitor . . . without resultant complication from the [weighted feeding tube] misplacement. However, we have noted unusual events of [weighted feeding tube] misplacement since introduction of this model.*

*The nurse inserted a small-bore feeding tube for enteral nutrition. Upon confirmation x-ray for tube placement, tube placement was noted to be in the left pleural space. Small-bore feeding tube was removed, and a repeat x-ray was taken. Repeat x-ray showed a left pneumothorax, which required an insertion of a chest tube.*

### MANUFACTURER DISCONTINUES ENTERAL FEEDING DELIVERY SYSTEM

Abbott, a global healthcare company based in Illinois, announced on October 17, 2012, and again on December 10, 2012, that it would discontinue the manufacture, lease, and sale of all enteral device products in the United States, effective April 30, 2013. The announcements from the Abbott Nutrition division further explained that

Table 1. Misplaced Small-Bore Feeding Tubes, January 2011 through October 2013, as Reported to the Pennsylvania Patient Safety Authority

YEAR	INCIDENTS	SERIOUS EVENTS	TOTAL
2011	4	9	13
2012	3	3	6
January to October 2013	13	12	25
<b>Total</b>	<b>20</b>	<b>24</b>	<b>44</b>

this included pumps, disposable sets, feeding tubes, kits, and related device accessories.<sup>12</sup>

The announcements and Abbott’s website stated, “We encourage you to identify an alternative enteral device supplier and begin the transition to meet your ongoing pump, set and feeding tube needs.”<sup>13</sup> As a result, facilities that owned or leased Abbott’s enteral feeding delivery system had to identify and convert to an alternative enteral feeding tube system in a relatively short time frame.

### POSSIBLE EXPLANATIONS FOR FEEDING TUBE MISPLACEMENTS

#### PSOs Investigate

Authority analysts interviewed PSOs of facilities that reported events in 2013 involving the misplacement of small-bore feeding tubes. The PSOs stated they noticed a trend of misplacements when reviewing incidents reported through their event reporting systems, including PA-PSRS, and investigated why this was occurring by talking to involved staff and conducting root-cause analyses. Common findings reported by the PSOs after their investigations included the following:

- Facilities had recently switched from Abbott’s enteral feeding delivery system to a different manufacturer’s enteral feeding delivery system.
- The events occurred within a month of switching to the different system.
- Staff members who misplaced the tubes had several years of experience in tube placement.

- The misplaced tubes were weighted, 8 French\* small-bore nasogastric feeding tubes—the same size and type as the tubes used before switching to a different manufacturer.
- The facilities used “blind placement,” in which placement occurs without visualization of the access route. Placement was then verified with a radiographic confirmation after the tube was placed.
- Staff were not consistently trained on the use of new feeding tubes.

One PSO stated that staff described the integral lubrication on the new small-bore feeding tubes as “slicker” than that of the previous brand of feeding tubes, which may have caused the new tubes to have less resistance than the former tubes as the tubes were advanced during placement, in their opinion. The staff also opined that the new feeding tubes appeared to be less pliable than the previous feeding tubes.

#### Action Plans

Several initiatives were identified by the PSOs in action plans to correct the misplacements of the small-bore feeding tubes. Actions for some, if not all, of the facilities included the following:

- Trialing and evaluating other enteral feeding device products
- Reviewing literature on feeding tube placement to determine evidence-based placement procedures

\* The outer diameter of a feeding tube is measured in French units. One French unit equals 0.33 millimeters.

- Using a simulation laboratory to practice feeding tube placement
- Redefining which staff and what kind of training is appropriate for the insertion of feeding tubes
- Restructuring vendor communication processes and initiating steering committees to include senior leadership and clinical stakeholders

### RESULTS OF LITERATURE REVIEW

A literature search of the databases from the National Quality Measures Clearinghouse, PubMed, Embase, the Cumulative Index to Nursing and Allied Health Literature, and the American Association of Critical-Care Nurses revealed no articles that specifically addressed training requirements or other safety precautions to follow when switching enteral feeding delivery system manufacturers.

#### Incident Rates

In the literature, it is estimated that more than 1.2 million small-bore feeding tubes are used annually in the United States.<sup>48</sup> Evidence accumulated for over 25 years of blind placement shows that 1% to 2% of small-bore feeding tubes were misplaced in the lungs and that pulmonary injury occurred in 0.3% to 1.2% of patients.<sup>48</sup> More recent studies suggest that 0.1% to 0.3% of all patients who have blindly placed small-bore feeding tubes die as a result of bronchopulmonary injury from misplaced tubes.<sup>48</sup>

#### Practices to Prevent Misplacements

Although the literature does not specifically address training requirements or other safety precautions when switching to a different manufacturer’s enteral feeding delivery system, there is endorsement of a variety of methods to verify placement of feeding tubes.<sup>9,12</sup> This includes a method used at the bedside during tube placement that would allow for repositioning of a misplaced tube, followed by radiographic confirmation.



While there is no consensus on a particular combination of practices to use for checking the placement, there is general agreement that a two-step method be utilized to decrease the number of misplacements.<sup>9,12</sup> Manufacturers of nasogastric feeding tubes, such as CORPAK MedSystems and Covidien, recommend confirming tube position per institutional protocol.

Studies in the literature show several recommended methods to check the positioning of small-bore feeding tubes during and after placement. Assessment of feeding tube position after it has been inserted to approximately 30 to 35 cm allows repositioning of misplaced tubes and can prevent pulmonary injury.<sup>9,12</sup> See Table 2 for a review of practice methods to determine feeding tube placement.

Although there is limited published data, preliminary results of a survey conducted by the University of Virginia Health System suggest that more than 66% of facilities routinely use blind placement and have not adopted a standard method for verification of small-bore feeding tube placement.<sup>4</sup>

Recommendations for placement and verification of feeding tubes have been published by the American Association of Critical-Care Nurses,<sup>10,13</sup> the American Society for Parenteral and Enteral Nutrition,<sup>11</sup> the Joanna Briggs Institute,<sup>9</sup> and the National Patient Safety Agency.<sup>12</sup> See Table 2 for an overview of selected practices.

As noted in a past *Pennsylvania Patient Safety Advisory* article<sup>14</sup> and in other studies,<sup>9,13</sup> three practices that were used for tube verification were not recommended

by studies due to their lack of effectiveness and potential risk for harm:

1. Auscultation (instilling air into the feeding tube with a syringe while using a stethoscope placed over the stomach to listen for bubbling of liquid contents in the stomach)
2. Aspirate inspection (assessing the appearance of aspirate from the tube)
3. Bubbling (observing bubbles when the end of the feeding tube is placed under water)

### ONE DOCTOR'S EXPERIENCES

A patient who died as a result of a feeding tube misplacement prompted Vihass Patel, MD, FACS, CNSC, director of the Metabolic Support Service and interim

Table 2. Selected Methods Used to Check the Position of Small-Bore Feeding Tubes

METHOD	TYPES OF PRACTICES
Capnography	The measurement of carbon dioxide (CO <sub>2</sub> ) in expired air directly indicates changes in the elimination of CO <sub>2</sub> from the lungs. <sup>1-3</sup>
Colorimetric capnometry	A CO <sub>2</sub> detector incorporates a colorimetric paper technology engineered to display a change in color from purple to yellow within seconds when the presence of CO <sub>2</sub> is detected. <sup>1-3</sup>
Measure of pH aspirate	This practice determines the pH of the fluid aspirated from the feeding tube. Gastric fluid is usually acidic, with a pH less than or equal to 5.5. Respiratory secretions are almost always alkaline, with a pH greater than or equal to 7. Measurement of pH aspirate may not be possible with a feeding tube inserted to 35 cm, because fluid may not be available to sample from that anatomic position. <sup>4</sup>
Electromagnetic visualization	A transmitter is used in the tip of the feeding tube stylet. An external receiver unit is placed over the xiphoid process, and a monitor shows a real-time display of the tube position in both anterior and cross-sectional view. <sup>1</sup>
Radiographic confirmation	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. <sup>4-7</sup>

NOTES

1. Krenitsky J. Blind bedside placement of feeding tubes: treatment or threat? *Pract Gastroenterol* 2011 Mar;35(3):32-42.
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3. Joanna Briggs Institute. Methods for determining the correct nasogastric tube placement after insertion adults. *Best Pract* 2010;14(1):1-3.
4. National Patient Safety Agency. Reducing the harm caused by misplaced nasogastric feeding tubes [online]. 2005 Feb [cited 2014 Feb 26]. <http://www.npsa.nhs.uk/nrls/alerts-and-directives/alerts/feedingtubes>
5. American Association of Critical-Care Nurses. Verification of feeding tube placement (blindly inserted) [practice alert online]. 2009 Dec [cited 2014 Feb 26]. [http://www.aacn.org/WD/Practice/Docs/PracticeAlerts/Verification\\_of\\_Feeding\\_Tube\\_Placement\\_05-2005.pdf](http://www.aacn.org/WD/Practice/Docs/PracticeAlerts/Verification_of_Feeding_Tube_Placement_05-2005.pdf)
6. Confirming feeding tube placement: old habits die hard. PA PSRS Patient Saf Advis [online] 2006 Dec [cited 2014 Feb 26]. [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2006/Dec3\(4\)/Pages/23.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2006/Dec3(4)/Pages/23.aspx)
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director of the Intensive Care Unit, Brigham and Women's Hospital, Boston, Massachusetts (a teaching affiliate of Harvard Medical School), to research and present information to the Intensive Care Unit Leadership Committee at the hospital. The information addressed how to safely and expeditiously establish enteral access after it is determined enteral nutrition support is required.<sup>15</sup>

In an interview conducted by Authority analysts,<sup>16</sup> Dr. Patel recommended that staff use descriptions whenever possible when referring to a feeding tube instead of just using a brand name. Even though tubes are produced by a variety of companies, healthcare staff communicate brand names interchangeably, according to Dr. Patel. This can cause confusion for healthcare staff when documenting or caring for the patient, since the tubes are different in size, shape, and purpose.

Education of staff who regularly place feeding tubes is key to successfully managing misplacements. "With every new

device, there is a learning curve," Dr. Patel said. "Ultimately, this is an operator issue. Training and education improves safety."

At Brigham and Women's Hospital, feeding tubes are placed during the day in a two-step radiographic process for patients who do not have a gag reflex. The tube is placed up to 30 cm, and then a portable x-ray is performed. "You have to have imaging guidance for patients who are at high risk," Dr. Patel said. The tube is then advanced, and another confirmatory x-ray is performed. See the Figure, available in the online version of this article on the Authority's website at [http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2014/June;11\(2\)/Pages/home.aspx](http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2014/June;11(2)/Pages/home.aspx), for a flowchart used for feeding tube placement.

## CONCLUSION

Even though the process of inserting small-bore nasogastric tubes may be a common practice for trained healthcare professionals, it is suggested that staff

be consistently trained when changing brands of enteral feeding tubes. Training is also proposed for staff with adequate experience and expertise who are coming from another facility that used different tubes and enteral feeding delivery systems. It is suggested that incidents involving misplacement of enteral feeding tubes be thoroughly investigated to identify the factors leading to the misplacement and/or the failure to identify the misplacement in a timely manner to avoid patient harm.

Several studies indicate that blindly placing feeding tubes and performing a follow-up radiography is less effective than combining placement practices in a two-step process, especially for patients who are at high risk.<sup>9-12</sup> It is recommended to keep the focus on being well trained in whatever process the hospital chooses to use based on available hospital equipment and staff resources.

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