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**ASK THE QUESTION**

**Question 1:** Does the use of an abdominal x-ray for confirmation of bedside NG and OG tube placement result in fewer pulmonary complication rates than the use of auscultation of injected air and aspiration of gastric contents in adult patient?

**Objective:** Evaluate the evidence of radiographic evaluation versus air auscultation and pH testing in the prevention of pulmonary complications in patients with NG and OG tubes.

**Background:** Nasogastric and orogastric tubes are commonly placed blindly at bedside in adult patients. Pulmonary complications, such as aspiration of gastric contents, and inadvertent tube placement into the bronchopulmonary tree have been reported in patients with these devices. Currently, multiple methods for placement confirmation of NG and OG tubes exist. These include: radiographic imaging, air auscultation, and pH testing of tube aspirates.

**SEARCH FOR EVIDENCE**

**Search strategies:** Articles searched included English, research-based publications, published during the past 15 years.

**Databases:** Both PubMed and CINHAL were used as search databases.

**Key words/terms:** enteral, nasogastric, feeding tube, aspiration, pneumonia, respiratory, x-ray, radiography, confirmation, complication.

**CRITICALLY ANALYZE THE EVIDENCE**
Question 1: Does the use of an abdominal x-ray for confirmation of bedside NG and OG tube placement result in fewer pulmonary complication rates than the use of auscultation of injected air and aspiration of gastric contents in adult patient?

Grade Criteria: Radiographic imaging should be used to confirm all NG and OG tubes placed at bedside. Strong recommendation, low quality evidence.

Five studies were found evaluating the evidence of radiographic confirmation and air auscultation and pH testing in patients with natural orifice feeding tubes.

One systematic review of case reports and cross-sectional studies found that many case reports showed non-radiographic methods to not be reliable in placement confirmation of feeding tubes (Sanko, 2004).

A case series reviewed 5 pediatric ICU cases of malposition in the respiratory tract. 4/5 of these cases cite RN perception and/or non-radiographic methods to falsely verify placement (Creel & Winkler, 2007).

A cross-sectional review of 740 patients in an adult ICU found that 2% of narrow bore feeding tubes were inadvertently inserted into the bronchiopulmonary tree. Furthermore, malposition was not detected from clinical presentation and auscultation in the majority of these cases (Rassias, Ball & Corwin, 1998).

One cross sectional study of 52 patients fed by NG tubes found that 42% of the patients received antacids or PPI’s, indicating pH testing as a potentially ineffective method for placement verification (Taylor & Clemente, 2005). The study also included a randomized controlled trial involving 6 dieticians testing 6 different types of pH strips. At least half of these subjects were only able to correctly identify the pH in 3 of these strip types.

The final study was a cross-sectional study of more than 2,000 patients with natural orifice feeding tubes in a tertiary care academic medical center. All of these patients received radiographic imaging to confirm placement. The study found that 1.3-2.4% of these patients had malpositioned tubes detected on an x-ray. In 26% of these cases, placement-related complications were documented (Sorokin and Gotlieb, 2006).

PICO Question #1 Does the use of an abdominal x-ray for confirmation of bedside NG and OG tube placement result in fewer pulmonary complication rates than the use of auscultation of injected air and aspiration of gastric contents in adult patient?

<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Purpose of Study</th>
<th>Study Design</th>
<th>Sample Size/Patient Population</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanko, 2004</td>
<td>Review research studies to recommend best practice to prevent feeding tube-related complications.</td>
<td>Systematic review of case reports and cross-sectional studies</td>
<td>Patients of all ages with all natural orifice feeding tube types. Sample sizes varied.</td>
<td>Several case studies showed that non-radiographic methods were not reliable when used alone.</td>
<td>Study Limitations = None</td>
</tr>
</tbody>
</table>

Lower Quality Rating if:
- Studies inconsistent (When there are differences in the direction of effect, the size of the differences of effect, and the significance of the differences that cannot be reasonably explained)
- Studies are indirect
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Study Design</th>
<th>Patients/Setting</th>
<th>Findings</th>
<th>Study Limitations</th>
<th>Quality Rating因素</th>
<th>Level of evidence for studies as a whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creel &amp; Winkler</td>
<td>2007</td>
<td>Case series</td>
<td>5 pediatric patients in a single ICU. 5 cases involved tube placement in the respiratory tract. 4/5 cases cite the RN reporting to believe the tube was in the correct position prior to radiography. 1 case showed air auscultation and aspiration of gastric contents to falsely confirm placement.</td>
<td>Study Limitations: None Insufficient sample size Stopped early for benefit Lack of allocation concealment Selective reporting of measures Large losses to F/U</td>
<td>(Your PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)</td>
<td>None</td>
<td>High/Moderate/Low/Very Low</td>
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<tr>
<td>Hassias, Ball &amp; Corwin</td>
<td>1998</td>
<td>Retrospective review</td>
<td>740 patients who received a narrow bore feeding tube in an adult ICU over a period of two years in a single hospital. 2% of tubes were inadvertently inserted into the bronchiopulmonary tree. Malposition was not detected from clinical signs and auscultation in the majority of these cases.</td>
<td>Study Limitations: None Insufficient sample size Lack of blinding Stopped early for benefit Lack of allocation concealment Selective reporting of measures Large losses to F/U</td>
<td>None</td>
<td>None/Moderate/Low/Very Low</td>
<td></td>
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<tr>
<td>Taylor &amp; Clemente</td>
<td>2005</td>
<td>Cross-sectional</td>
<td>Objective 1: 52 patients fed by NG or NI tube in a single hospital. Objective 1: 42% of patients were taking H2 Blockers and/or PPIs. Objective 2: 6 dieticians testing pH strips in a single hospital. Objective 2: 50% or more dieticians incorrectly classified pH in 3 of 6 types of strips.</td>
<td>Study Limitations: None Insufficient sample size Lack of blinding Stopped early for benefit Lack of allocation concealment Selective reporting of measures Large losses to F/U</td>
<td>None</td>
<td>None/Moderate/Low/Very Low</td>
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<tr>
<td>Sorokin and Gottlieb, 2006</td>
<td>Identify rates of malposition and complications in natural orifice feeding tubes.</td>
<td>Cross-sectional</td>
<td>&gt;2000 patients of all ages in a 680 bed tertiary-care academic medical center.</td>
<td>1.3-2.4% of cases had documented tube misplacement on radiographic imaging. 26% of these cases developed complications.</td>
<td>Study Limitations = None</td>
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</table>

**APPLY THE EVIDENCE**

Radiographic imaging is superior to air auscultation and aspiration of gastric contents in verifying placement of NG and OG feeding tubes and preventing complications. The studies were indirect, lacking sufficient sample sizes and controls. Therefore, further research is necessary, the following policy revisions are proposed:

- Obtain radiographic confirmation of all blindly inserted nasogastric tubes prior to initial use for feeding or medication administration
- Bedside KUB x-ray
- X-ray reading performed qualified physician or midlevel provider
- Provider instruction in McKesson or Epic to initiate feedings and/or medication administration

**REFERENCES**