Nasogastric Intubation and Check Image Interpretation.

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NPSA suggests 171,000 fine bore nasogastric tubes are sold to the NHS per annum.

Many Trusts treated ward intubation of these tubes as a casual every day occurrence .....and yet ......
A misplaced naso or orogastric tube not detected prior to use.’

Was one of the original 8, (now 25) NPSA ‘never events’.

Defined as:

‘Specific serious untoward patient safety incidents that should not occur if national guidance is followed.’
Never Events:
Naso/orogastric intubation mortality.

The question has to be asked is, why?

Why is....

‘A misplaced naso or orogastric tube not detected prior to use.’

up there along with more obvious ‘never events’ such as......

– Amputating the wrong limb?
– Removing a healthy kidney in error?
– Killing a patient by injecting potassium chloride in error?
Never Events:
Naso/orogastric intubation mortality.

- Between 2005 and 2010 there were reported:
- 21 deaths and 79 cases of harm from feeding through misplaced fine bore tubes. *
- The single greatest cause of patient death or harm being check image interpretation errors by F1’s and F2’s.
- Learning on a see one, do one teach one basis.

In North Bristol (2009) a patient died following feeding through a nasogastric tube sited in the right lung.

The check x-ray was mis-interpreted on the ward.
A Trust wide audit of nasogastric intubation practice was undertaken.

* NBT recognised that a change in culture was required and needed to be driven from the top down by a Nutritional Steering group that had Senior multidisciplinary support.
Audit findings

- Marked lack of documentation.
- Intubation was treated as a casual everyday occurrence.
- Many of the tube types used had a low radiodensity.
- Junior clinical staff were interpreting images with no standardised training or proven competence.
- Limited radiology reporting of misplacement errors during the normal working day.
- Limited tube re-siting in radiology at the time of image check.
- Check imaging in radiology was not considered to be urgent.
To change the culture:

The recommendations covered 4 categories:

- Documentation
- Intubation
- Radiology
- Interpretation
## Adult NG Tube Insertion Record

**Small Addressograph:**
- Patient surname:  
- First name:  
- Hospital no:

**REF:** NPSA Alert (NPSA/2011/PSA002)

### 1st Insertion

**Assessing Safety**
- GC feeding is right for this patient?  Y ☑️  N ☐️
- Sufficient expertise to place and confirm:  Y ☑️  N ☐️
  - 06.00-21.00 General wards  
  - Out of hours only after cancer medical discussion.

**Record your rationale for insertion:**
- Your name: (BLOCK CAPITALS)  
- Signed:  

**Date of insertion:**
- Time of insertion? (24-hr clock):  

**Inserted by:** (BLOCK CAPITALS)  
- Signed:  

### Confirmation
- 1. pH ≤ 5 from gastric aspirate.  
  * Where aspirate is not obtained but swallowing is safe, notify after patient drank half-diluted orange squash.**  
  IF 1. Fails, GO TO 2.
- 2. Trained interpretation of a clear X-ray or Contrast trace  
  **TICK BOTH TO CONFIRM GASTRIC POSITION**
  
  **Tube follows centre-line with no L/R deviation at:**  
  - Cardia (x-ray) or  
  - Chest level (Contrast)
  AND
  **Tube tip is below:**  
  - Diaphragm (x-ray)  
  - AP horizontal line  
  - CS becomes shallow (Contrast)

- 3. Confirmed safe to feed only if:  
  - 1. or 2. (above) indicate gastric position  
  AND
  - Tube depth pre-marked at nose  
  OTHERWISE, UNSAFE: remove tube

### 2nd Insertion

**Assessing Safety**
- GC feeding is right for this patient?  Y ☑️  N ☐️
- Sufficient expertise to place and confirm:  Y ☑️  N ☐️
  - 06.00-21.00 General wards  
  - Out of hours only after cancer medical discussion.

**Record your rationale for insertion / re-insertion:**
- Your name: (BLOCK CAPITALS)  
- Signed:  

**Date of insertion:**
- Time of insertion? (24-hr clock):  

**Inserted by:** (BLOCK CAPITALS)  
- Signed:  

### Confirmation
- 1. pH ≤ 5 from gastric aspirate.  
  * Where aspirate is not obtained but swallowing is safe, notify after patient drank half-diluted orange squash.**  
  IF 1. Fails, GO TO 2.
- 2. Trained interpretation of a clear X-ray or Contrast trace  
  **TICK BOTH TO CONFIRM GASTRIC POSITION**
  
  **Tube follows centre-line with no L/R deviation at:**  
  - Cardia (x-ray) or  
  - Chest level (Contrast)
  AND
  **Tube tip is below:**  
  - Diaphragm (x-ray)  
  - AP horizontal line  
  - CS becomes shallow (Contrast)

- 3. Confirmed safe to feed only if:  
  - 1. or 2. (above) indicate gastric position  
  AND
  - Tube depth pre-marked at nose  
  OTHERWISE, UNSAFE: remove tube

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**Please see guidance overleaf.**

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v.3
Standardise to using a high radio-density tube and tip with cm. markings and hydrophilic lining.
NPSA compliant tubes:
Audit recommendations - intubation

- As a routine, intubation & check imaging overnight for feeding purposes to cease as expert imaging support may not be available (NBT).

- Overnight tube insertions for medication purposes only. Requested intubation and check images overseen and reviewed by registrar grade or above.
Audit recommendations
Radiology

Radiology to accept that check imaging and associated patient safety is their responsibility.

Check imaging to be considered a priority.

All NG tube check images to be interpreted whilst the patient is in X-ray.

Check image annotation of tube tip location.

Tubes identified as being in the respiratory tract are to be removed immediately.

Clinical notes to come with the patient for documentation.

Identify suitable radiographers to interpret images and resite misplaced tubes.

The aim: For all mis-sited tubes to be correctly sited in X-ray prior to the patient returning to the ward.
A learning package and test was devised to assist with training and give an indication of competence.

Subsequently developed as an e-learning module with the support of Merck Serono and now freely available at [www.trainingngt.co.uk](http://www.trainingngt.co.uk).

The module provides an understanding how to accurately interpret check X-rays to identify tube tip location.

A 100% result is required to be considered competent to interpret.
NPSA background.

Contraindications and complications of intubation.

Problems associated with FB intubation - with a case example.

NPSA misplacements incidence.

Developing protocols to avoid tube misplacement never events.

How to interpret check images with emphasis on the importance of the carina.

Multiple check X-ray image examples with explanatory text.
Welcome to this e-Learning module

Please review the e-Learning module then register and take the multiple choice assessment.

This training module will help you to learn how to minimise the risk of feeding patients through a misplaced nasogastric tube.

It has been developed in collaboration with Mr Robert Law, Consultant GI Radiographer, North Bristol NHS Trust, based upon his team’s award-winning project ‘Improving the practice of nasogastric feeding tube placement’ (National Patient Safety Awards 2011).

The NPSA endorsed module equates to **one** Distance Learning Credit for the CPD Scheme of the Federation of Royal Colleges of Physicians of the UK.
START: Assess whether the tube is fully radio-opaque throughout its length and tip with regular cm markings.

Is the image straight?
- **YES**
  - Identify the carina. Does the tube pass down the midline bisecting the confluence of the right and left main bronchi?
    - **YES**
      - Does the tube pass down the midline past the level of the diaphragm and then deviate to the **LEFT OR RIGHT**?
        - **RIGHT**
          - The tube is almost certainly in the stomach
        - **LEFT**
          - Can you see the tube tip?
            - **YES**
              - Does the cm. mark at the nose support the tube being 5-10cms into the stomach?
                - **YES**
                  - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**
                - **NO**
                  - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**
            - **NO**
              - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**
    - **NO**
      - Are you happy to take patient rotation into account?
        - **YES**
          - Can you see the tube?
            - **YES**
              - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**
            - **NO**
              - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**
        - **NO**
          - The tube may still be in the respiratory tract in the posterior base of the lung. Seek advice from a radiologist. **DO NOT FEED**

- **NO**
  - Radiology may not be beneficial in this case
  - Has the tube come out / Is it coiled in the mouth / Pharynx? DO NOT FEED
  - Seek advice - DO NOT FEED
  - Remove the tube - it is likely to be in the respiratory track. DO NOT FEED
Correctly identifying what happens to the tube at the carina is fundamental to safe check image interpretation.
Identifying the carina,
A recurring theme:

This diagram illustrates how the carina appears to be bisected by the NG tube.

- Carina
- Right main bronchus
- The area under the carina which the tube must pass through to 'bisect' the carina

Bisecting the carina - the tube does not have to pass precisely down the midline but it must enter the area underneath the carina.
Correctly identifying what happens to the tube at the carina is fundamental to safe check image interpretation.
Correctly identifying what happens to the tube at the carina is fundamental to safe check image interpretation.
Considerations:

1. The tube is well in the stomach and it is safe to feed.

2. The tube is in the GIT but the tip is not seen. If the cm marks on the tube are appropriate it can be considered to be in the stomach and safe to feed.

3. Uncertain of tube position – Therefore unsafe to feed. Seek radiological opinion.

4. The tube is not satisfactorily sited – it is unsafe to feed.

5. The tube is in the respiratory tract and will be removed immediately.
Conclusion

The change of culture required to improve patient safety was achieved through a coordinated multidisciplinary approach with a desire at senior level to drive through change.

The service is still not perfect....

But the culture has changed, there is now a focal awareness of patient safety in this area and following the introduction of the e-learning package image interpretation has significantly improved.
1. **Documentation** - An intubation record with mandatory documentation, name and signature, required against each section in turn.

2. **Intubation:** Standardise tube type - high radio-density tube and tip with cm markings.

   **No** intubation or check imaging for feeding tubes overnight.

3. **Radiology:** Check image interpretation a radiographer led service.

   Check imaging treat as a priority.

   Working day, Images interpreted whilst patient in radiology.

   Immediate removal and resiting of tubes in the respiratory tract.

4. **Interpretation:** Standardised junior doctor training for check image interpretation, with mandatory proof of competence.
Thank you
## Audit / re-audit results

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<tr>
<th>Category</th>
<th>Audit</th>
<th>Re-audit</th>
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<tr>
<td>Referrals</td>
<td>192</td>
<td>200</td>
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<tr>
<td>Waiting: Before 21.00 hrs</td>
<td>1.6 hrs</td>
<td>1.5 hrs</td>
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<tr>
<td>After 21.00 hrs</td>
<td>4.0 hrs</td>
<td>2.0 hrs</td>
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<tr>
<td>Imaging post 21.00 hrs:</td>
<td>31/192 16.0%</td>
<td>9/200 4.5%</td>
</tr>
<tr>
<td>Total Misplacement errors</td>
<td>43/192 22.0%</td>
<td>34/200 17.0%</td>
</tr>
<tr>
<td>Radiographer resiting:</td>
<td>9/43 21.0%</td>
<td>16/34 47.0%</td>
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<tr>
<td>F1/F2 interpretation errors:</td>
<td>7/43 16.0%</td>
<td>1/34 3.0%</td>
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<tr>
<td>Poor documentation:</td>
<td>49.0%</td>
<td>29.0%</td>
</tr>
</tbody>
</table>
"If in doubt, take it out“.

Sometimes NG tubes can appear to deviate at the level of the carina when they are in a hiatus hernia - particularly if it is incarcerated.

However, any deviation in the chest - particularly if extreme like this - should raise the question:

- Could this tube be in the lung?
Although the tube deviation is at the level of the carina, water soluble contrast demonstrated that the tube was in a hiatus hernia.