GUIDELINE FOR THE USE OF ORO/NASOGASTRIC TUBES ON THE NEONATAL UNIT

Rationale
Oro/nasogastric tubes are frequently indicated for premature and sick infants on the neonatal unit, for a variety of reasons, including:

- an inability to take feeds orally;
- gastric decompression;
- the administration of medication;
- the absence of a gag reflex;
- congenital anomalies;
- prematurity;
- poor coordination of sucking and swallowing;
- paralysis as a result of medication.

Practice
Insertion of oro/nasogastric tubes

- Inform parents, if present;
- Gather all equipment, including an enteral syringe; CE marked pH strips; gloves; a dressing to secure the tube and an appropriately sized feeding tube. A larger tube may be required to facilitate gastric decompression in surgical infants or those on CPAP;
- Place the infant in a comfortable position. Consider the use of containment/still holding, swaddling and/or non-nutritive sucking to minimise stress for the infant;
- Calculate the desired length of the gastric tube by measuring the distance from the nose (or mouth for orogastric tubes) to the ear and then to the mid-point between the xiphoid process and the umbilicus. The xiphoid process is at the base of the sternum and this measurement is known as the NEMU measurement;
- Check this length by using the following weight-based calculation and insert the tube to the greatest length obtained with either of the techniques. The weight-based calculation and a table of values for different weights is shown overleaf:
NGT length = \[3 \times \text{weight (kg)}\] + 13cm for NGT

or

OGT length = \[3 \times \text{weight (kg)}\] + 12cm for OGT

<table>
<thead>
<tr>
<th>WEIGHT RANGE (kg)</th>
<th>NGT LENGTH</th>
<th>OGT LENGTH</th>
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<tbody>
<tr>
<td>Up to 0.8kg</td>
<td>15cm</td>
<td>14cm</td>
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<td>0.801kg to 1.1kg</td>
<td>16cm</td>
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<td>1.101kg to 1.5kg</td>
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<td>1.801kg to 2.1kg</td>
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<td>4.101kg to 4.5kg</td>
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<td>4.501kg to 4.8kg</td>
<td>27cm</td>
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<td>4.801kg to 5.1kg</td>
<td>28cm</td>
<td>27cm</td>
</tr>
<tr>
<td>5.101kg to 5.5kg</td>
<td>29cm</td>
<td>28cm</td>
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</tbody>
</table>

- Wear gloves and advance the tube gently but quickly via the mouth or nostril into the oesophagus until you reach the desired length, pausing if you meet resistance;
- Hold or secure the tube while you verify the position of the tube by connecting an enteral syringe to obtain gastric aspirate and check the gastric pH (see section below on ‘verifying position of oro/nasogastric tubes’ for more information about acceptable pH values);
- If no gastric aspirate is obtained at all, perform the steps outlined in the flow chart in Appendix B, including:
  - turn the infant onto their side and re-aspirate;
  - instill 1-2ml of air into the tube with an enteral syringe, in an attempt to move the tip of the tube away from the gastric mucosa and into the gastric pool and re-aspirate. This is NOT a testing procedure but a method of trying to obtain an aspirate. It is
important to note that auscultation while the air is instilled, sometimes known as the “whoosh test”, is NOT an acceptable method of verifying the tube position;

- advance/withdraw the tube by 1-2cm and re-aspirate;
- re-site tube and re-aspirate;
- if the baby is able to safely take a small volume of milk orally, consider this and then re-aspirate;
- consider an x-ray to confirm position, if this is planned for another reason or it is deemed safe to do so.

**Verifying position of oro/nasogastric tubes**

Gastric tube feeding, both naso and orogastric, is used extensively in neonatal units and thousands of tubes are inserted daily without incident (NPSA 2005). However, there is a small risk that the tube can become misplaced into the lungs during insertion, or move out of the stomach at a later stage (NPSA 2005). Misplaced nasogastric tubes represent a potentially serious risk, with complications including delays to feeds and medication, aspiration, pneumothorax, gastric perforation, pneumonia and death (Taylor *et al* 2014).

A National Patient Safety Agency (NPSA) alert called ‘*Reducing the harm caused by misplaced naso and orogastric tubes in babies under the care of neonatal units*’ (2005) provides additional guidance that is specific to neonates, as they differ physiologically from adults and children, in terms of gastric pH. For example, it is often impractical and unsafe to wait for a period of time, without feeding, to see if the neonatal gastric pH becomes more acidic, as is advised as a potential option for adults. In addition, gaining aspirate from fine bore feeding tubes can be difficult. The British Association of Perinatal Medicine has worked with the NPSA on developing this advice and it has been agreed by the Neonatal Nurses Association and the Royal College of Paediatrics and Child Health.

This 2005 guidance highlights several factors that will affect the pH of neonatal gastric aspirates, which includes:

- the frequency of feeding, as babies on a neonatal unit may be fed continuously or frequently (1-2 hourly);
- the small volumes of gastric aspirate;
• the administration of medications, including those for reflux, which may neutralise the pH
• the presence of amniotic fluid in the stomach, especially if the baby is <48 hours old
• the gestation at birth and the postnatal age, as the newborn gastric pH is generally more neutral than in later life, particularly in premature babies and up to around day 10 of life.

This NPSA guidance (2005) states that “even though aspirates testing pH 5.5 and below should indicate correct placement in most babies, including the majority of those receiving acid suppressants, some babies will consistently have pH values of 6 and above.” A gastric pH of 5.5 is the recommended cut off to proceed to feeding without further action but a gastric pH of 6 may also be acceptable, following a balance of risks and discussion with senior staff. The most likely reason for failing to obtain a gastric pH of 5.5 or less is the dilution of gastric acid. However, in this instance staff must consider and document the actions outlined in the flow chart in Appendix B, including:

• advance or withdraw the tube by 1-2 cm and re-aspirate;
• re-site the tube and re-aspirate.

If the gastric pH remains >5.5, discuss with senior medical staff and consider the following:
• feeding frequency;
• medication;
• age of the baby (are they <48 hours old);
• tube length (is this the same length as documented previously, has the length changed from when the last x-ray was taken/tube position was checked?);
• an x-ray if one is due for other reasons and/or it is clinically safe to do so.

Although its application has not been validated in neonates, ultrasound may be a potentially helpful adjunct to evaluate tube placement, providing a member of the senior medical team feels competent and confident to do so.

All actions, decisions and rationale must be documented if a pH of 6 or above is obtained.
Ongoing safety of oro/nasogastric tubes

- Gastric pH and the external tube length must be checked following insertion of an oro/nasogastric tube and prior to the administration of feeds/medication or if any movement of the tube is suspected e.g. following a vomit, insecure fixation method;
- An insertion bundle must be completed for each new oro/nasogastric tube, documenting the size and length of the tube, as well as the date and time of insertion;
- An ongoing care bundle must be completed every shift for each oro/nasogastric tube;
- The gastric pH and external tube length must be documented each time a feed is administered;
- Air should be aspirated from the gastric tube every 2 hours when an infant is receiving nasal CPAP with flow rates of >5lpm and this volume should be documented on the feed chart;
- Oro/nasogastric tubes must be replaced in accordance with the manufacturer’s recommended guidance;
- Following surgery, any misplaced trans-anastomotic tubes (TATs) must not be re-sited without agreement from a surgeon/Neonatal Consultant;
- Infants must not be left unattended during gravity tube feeds;
- A patient identifier label with the date of insertion must be affixed to each oro/nasogastric tube to allow maternal breast milk administration checks to be performed;
- Ensure that oro/nasogastric tubes are well-secured and that incubator/cot covers are not entirely obscuring the infant during the administration of enteral pump feeds;
- On completion of feeds, enteral syringes should be removed and the feeding tube closed, unless the infant is receiving nasal CPAP. In this instance, a clean/dry syringe must be connected to the tube to facilitate the escape of air from the stomach;
- The volume and colour of gastric aspirates must be documented as this may highlight feeding intolerance. Other signs may include vomiting and abdominal distension.

References


APPENDIX A: Methods to estimate oro/nasogastric tube length

A number of methods exist to estimate the correct length of oro/nasogastric tubes. This appendix summarises some of the issues associated with each of these methods.

1. The ‘NEX’ (nose to ear to xiphisternum) measurement

The NEX measurement is reported to be only 55-61% accurate (Cirgin Ellett et al 2011; Nguyen et al 2016 and Taylor et al 2014) and use of this method is likely to increase the risk of positioning the tube tip above the gastro-oesophageal junction (Dias et al 2017).

2. Age-related height-based formulae

A 2011 study of 173 infants (Cirgin Ellett et al 2011) found that the original age-related height-based formula was only 78% accurate. As length is not measured as frequently as weight in neonatal settings, an age-related height-based formula may not be as practical as one that is based on weight.

3. Ultrasonography

Larger studies are needed to determine the value of ultrasound to confirm neonatal gastric tube placement but it may be useful in detecting misplaced tubes where x-ray is not readily available (Tsujimoto et al 2017). In adults, ultrasound has been shown to have high sensitivity and specificity for gastric tube placement but it has not yet been validated in neonates. It may be an appropriate adjunct for evaluating tube placement when senior medical personnel feel confident and competent to do so.

4. The ‘NEMU’ (nose to ear to mid-umbilicus) measurement

This method involves measuring from the nose to the ear to a point midway between the xiphoid process and the umbilicus and has been estimated to be 91% accurate (Cirgin Ellett et al 2011). The integrative review by Dias et al (2017) supports the use of the NEMU measurement claiming it is the best evidenced method of determining gastric tube length to date. Both Dias et al (2017) and Nguyen et al (2016) advocate that the use of a weight-based formula as a check to the NEMU measurement is likely to increase the chance of correctly siting gastric tubes.
5. **Weight-based formulae**

Weight is a growth parameter that is regularly measured in neonatal units and is an objective parameter which may offer a useful way to check the measurements obtained using the NEMU method. Nguyen *et al* (2016) and Dias *et al* (2017) suggest that this dual approach may improve the accuracy of tube placement.
APPENDIX B: Oro/nasogastric tube flow chart for actions and decision-making, from NPSA guidance (2005)

1. Check for signs of tube displacement (if not initial insertion)
   2. Reposition or repass tube, if not initial insertion
   3. Aspirate using a syringe and gentle pressure

   Aspirate not obtained

   DO NOT FEED
   1. If possible, turn baby onto his/her side
   2. Re-aspirate
   3. Check pH level

   Aspirate not obtained

   DO NOT FEED
   1. Inject 1-2ml of air into the tube using syringe
   2. Re-aspirate
   3. Check pH level

   Aspirate not obtained

   DO NOT FEED
   1. Advance or retract the tube 1-2cms, if initial insertion, any resistance, STOP
   2. Re-aspirate
   3. Check pH level

   Aspirate not obtained

   CAUTION: DO NOT FEED AND:
   1. If initial insertion, consider replacing or re-passing tube
   2. If tube in situ, seek senior advice,
   3. Only consider chest and abdominal x-ray if timely
   4. Document decisions and rationale

   CAUTION: DO NOT FEED AND:
   1. Consider waiting 15-30 minutes then re-aspirate
   2. Consider replacing or re-passing tube and re-aspirating
   3. If still pH 6 or above, seek senior advice:
      • Medication
      • The tube – is it the same as that documented on last x-ray and is the length the same?
      • The feeding history
      • Balancing risks
   4. Only consider x-ray if timely
   5. Document decisions and rationale

   Aspirate obtained (0.2-1ml)

   Test on pH strip or paper

   pH 6 or above

   pH 5.5 or below

   DOCUMENT
   1. Measure length of tube and document, if initial insertion
   2. pH of aspirate
   3. Length of tube advancement/retraction, if done

   Proceed to feed

CAUTION: If there is ANY query about position and/or the clarity of the colour change on the pH strip, particularly between ranges 6 to 4, then feeding should not commence.