



HEALTHCARE SAFETY
INVESTIGATION BRANCH

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Interim Bulletin

Placement of Nasogastric Tubes

February 2020

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This interim bulletin contains facts which have been determined up to the time of issue. It is published to inform the NHS and the public of the general circumstances of events and incidents and should be regarded as tentative and subject to alteration and correction if additional evidence becomes available.



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Introduction

HSIB have launched an investigation looking at implementation of safety improvements for the placement of nasogastric tubes (NG tubes). The investigation commenced after HSIB was notified of a patient who inadvertently had a nasogastric tube inserted into his lung. There is a risk of serious harm and risk to life if NG tubes are incorrectly placed into the lungs rather than the stomach and feed is passed through them.

NG tubes are passed through the nose down the back of the throat and through the oesophagus to the stomach and are used to give medication, fluids or liquid feeds to patients. Each year at least 790,000 NG tubes are purchased in the NHS in hospitals and community settings (care home and home) (NHS Improvement, 2016). Patients may need nasogastric feeding, typically in the short to medium term, because:

- critical illness or unconsciousness leaves them unable to swallow at all;
- neurological conditions such as stroke leave them at risk of not being able to safely swallow food or drink normally by mouth; or
- they have conditions that mean they cannot take in enough food and drink by mouth to meet nutritional needs.

NG tubes have been the subject of numerous patient safety alerts in the last 15 years, and misplacement of these tubes are classified as a **'never event'** (NHS Improvement, 2018).



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In November 2018 the Trust involved in the reference event switched from pH testing strips (0-6.0 scale) to enteral testing strips with a pH 2.0-9.0 scale. This change was required as the ones previously in use were not CE marked, nor specifically designed for gastric sample testing.

National Context

Since 2005 there have been several safety alerts and initiatives aimed at mitigating the risks associated with placement of NG tubes, yet incidents are still occurring. The following table summarises the safety alerts and resources released in the last 14 years.

Date	Title	Summary
February 2005	Alert: Reducing the harm caused by misplaced nasogastric feeding tubes (The National Patient Safety Agency, 2005)	<p>NPSA found 11 deaths and one case of serious harm due to misplaced NG tubes in a two-year period.</p> <p>Actions centred on eliminating use of the 'whoosh test' (air auscultation), never relying on appearance of aspirate or absence of respiratory distress to confirm placement, replacing the use of litmus paper with the use of pH paper, and purchasing nasogastric tubes radiopaque throughout their length. The Alert established pH or x-ray as the only acceptable methods of confirming initial nasogastric tube placement.</p> <p>Supporting materials included information for carers of those who use NG tubes and patients who self-check NG tubes in community, and decision trees for checking placement in adults and children and babies (not neonates), including appropriate testing methods and individual risk assessment.</p>



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August 2005	Alert: Reducing the harm caused by misplaced naso and orogastric feeding tubes in babies under the care of neonatal units (National Patient Safety Agency, 2005)	Actions similar to the February 2005 Alert but with supporting materials specifically for neonates due to differences in gastric pH.
March 2011	Alert: Reducing the harm caused by misplaced nasogastric feeding tubes in adults, children and infants (The National Patient Safety Agency, 2011)	<p>NRLS received a further 21 reports of death and 79 of serious harm due to feeding into lungs as a result of misplaced NG tubes. Most related to misinterpretation of x-rays.</p> <p>Actions for all providers using NG tubes reinforcing aspects of the 2005 Alerts and with new actions centred on:</p> <ul style="list-style-type: none">• Use the ‘four criteria’ technique for x-ray interpretation and restrict placement confirmation via x-ray to staff assessed as competent in the technique• Restrict nasogastric placement and placement confirmation via pH to staff assessed as competent in the technique, including nil down the tube before initial pH testing• Using only pH test strips CE marked for use on human gastric aspirate• Providing structured documentation formats to reinforce these placement checks• Ongoing audits to monitor compliance <p>Various support materials were also provided.</p>



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March 2012	Rapid response report: Harm from flushing of nasogastric tubes before confirmation of placement (The National Patient Safety Agency, 2012)	NPSA aware of two deaths since March 2011 where NG tubes were flushed with water before placement had been confirmed. This gave an inaccurate pH reading that suggested the tube was not in the lungs. Immediate actions for Trusts to reinforce the 'never flush' rule and ensure all staff are aware. Manufacturers also changed tube labels that said 'give 10ml flush to remove guidewire' to be clear this was AFTER pH testing.
December 2013	Warning alert: Placement devices for nasogastric tube insertion DO NOT replace initial position checks (NHS England, 2013)	Two recent incidents involving food into lungs after an electromagnetic placement device was used instead of pH strips or x-ray to confirm placement, leading to patient deaths. Actions for all providers to establish if placement devices are used locally and ensure never to use to confirm placement.



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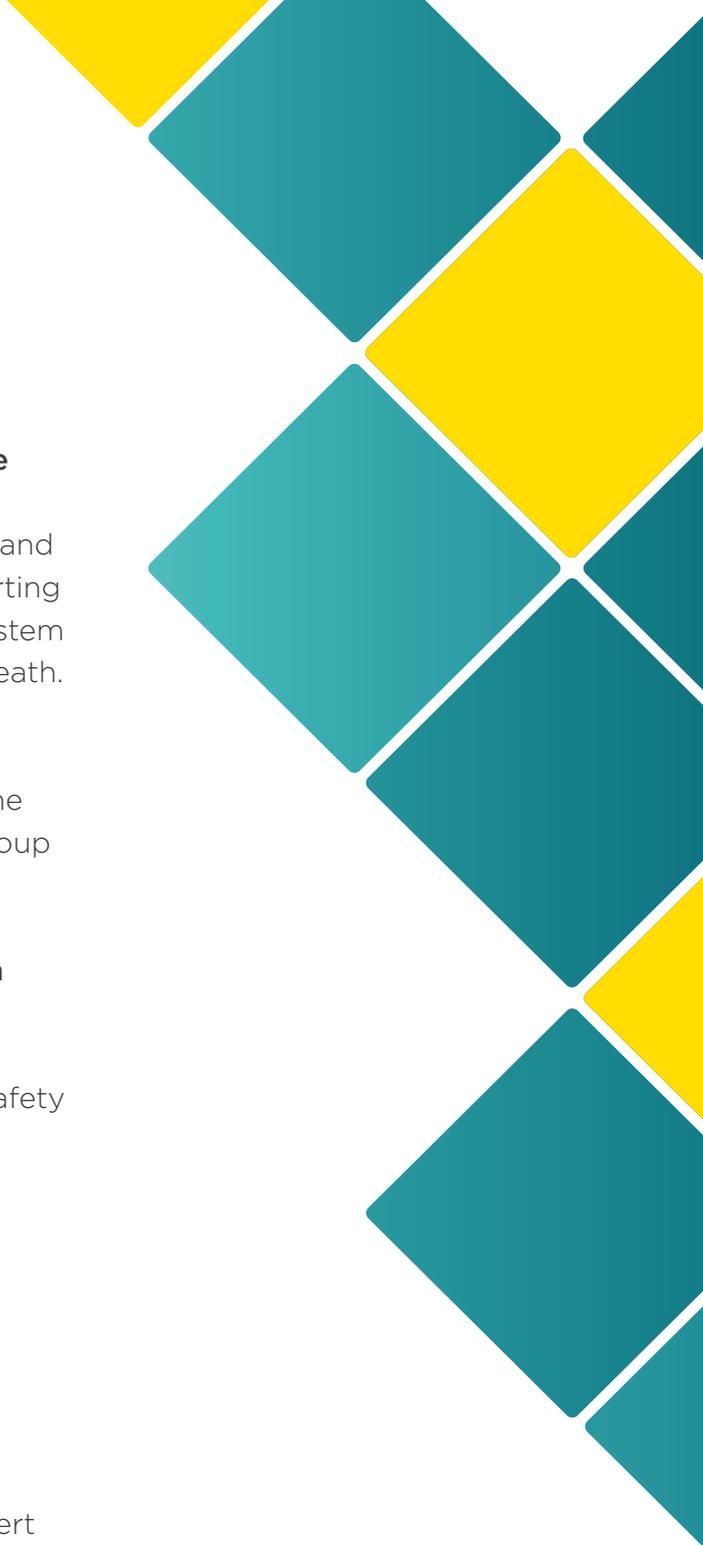
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2016

Alert: Nasogastric tube misplacement: continuing risk of death and severe harm (NHS Improvement, 2016)

The alert was issued in response to 95 incidents reported to NRLS and/or StEIS since the 2011 Alerts' completion date where fluids or medication was introduced to the lungs via a misplaced NG or orogastric tube. 32 of these patients died.

The most common error type continued to be when x-rays are misinterpreted by medical staff, with reports suggested competency-based training had not been provided and staff were not using the '**four criteria**' technique.

Alert directed to Trust boards and required them to undertake an assessment of whether the actions they had recorded as complete after the 2011 Alert had actually been completed, and if not to introduce them now. It required this assessment and any subsequent action plan to be shared with the Trust Board and published on the Trust's website.



Outcome Impact: what impact has a safety issue had, or is having, on people and services across the healthcare system?

Misplacement of NG tubes is a Never Event (note 1) and incidents reported to the NHS serious incident reporting system and the National Reporting and Learning System demonstrate that they can lead to severe harm or death.

NG tubes are often required in patients who are critically ill, and the harm caused by feed entering the respiratory tract can be particularly severe in this group of vulnerable patients.

Systemic Risk - How widespread and how common a safety issue is this across the healthcare system

Misplacement of NG tubes is a never event which persists across the NHS despite numerous patient safety alerts and safety initiatives.

Learning Potential - what is the potential for an HSIB investigation to lead to positive changes and improvements to patient safety across the healthcare system

The investigation to date has not identified a strong systemic barrier to prevent the misplacement of NG tubes. Early evidence from the investigation suggests there is potential learning around safety alert implementation within providers, procurement, elements of pH testing strip design, factors that influence decision making and the current processes for confirming NG tube placement.

¹ NHS Improvement (2018) defines Never Events as '**Serious Incidents that are wholly preventable because guidance or safety recommendations that provide strong systemic protective barriers are available at a national level and should have been implemented by all healthcare providers**'. They cover all aspects of NHS-funded care.

History of the Event

HSIB identified the case of a 26-year-old man, who was admitted to an emergency department in December 2018 following a fall from his bicycle whilst swerving to avoid a motor vehicle. He hit his head on a pavement. Seizures were observed, and on arrival to hospital was placed in an induced coma by an anaesthetic team prior to having a head-to-toe CT scan. He was transferred to the Critical Care Unit for ongoing care.

Whilst an in-patient on the Critical Care Unit, the patient had an NG tube inserted. On 22 December 2018 the patient became agitated and removed his own NG tube and a new tube was inserted to ensure his nutritional needs were met. This NG tube was confirmed as correctly inserted via a pH test of aspirate.

The patient had chest x-rays taken after the NG tube was inserted as his condition started to deteriorate thereafter. The purpose of the x-rays was to understand the deterioration in his condition as he had an increase in his oxygen requirements and cardiovascular support. This was thought likely to be secondary to a developing chest infection. These were missed opportunities to identify the misplaced NG tube.

It was subsequently found that the NG tube was inadvertently inserted into his lungs with enteral feed delivered into the airways. The patient received approximately 1450 ml of enteral feed into his lungs before his feed was stopped.

Once the misplaced NG tube was identified, the feed was removed from his lung via a bronchoscopy and saline washout. Following a stay on intensive care and subsequently on a ward, the patient was discharged home on 8 January 2019.

The investigation observed that at the time of this incident there were still boxes of non-CE marked pH testing strips in circulation on critical care, alongside the

new enteral pH strips. These two types of pH testing strips had different pH scales and used different colour coding schemes to represent the pH level. If the non-CE marked strip was exposed to a neutral substance such as a respiratory tract sample, and then inadvertently read this against the CE marked enteral pH testing strip scale, it reads as strongly acidic falling in the 2.0 -3.0 range. A pH of 2.0.-3.0 would indicate that the NG tube was correctly placed in the stomach.

As both these boxes of pH strips were kept together in the same area and the pH strips were very similar in appearance, it was possible that, in the reference event, the strip was compared to the wrong container. As such, gave false reassurance that the NG tube was correctly placed.

Safety risk

Although most other providers will have transitioned to pH paper CE marked for use on human gastric aspirate, the investigation identified risks related to the correct reading and interpreting of pH. These include:

- CE marked pH strips from manufacturers can have different pH colour coding scales.
- If a provider has more than one type of pH strip in circulation at the same time, there is a similar risk of error to that which was identified in the reference event – comparing a pH strip from one manufacturer against a container with a different pH scale. Therefore, having two or more CE marked strips in circulation could result in inaccurate readings.
- A lack of understanding in how to read a pH strip. There is no standardised competency framework and delivery model for training and assessment in nasogastric tube placement and undertaking pH checks. In addition, competency-based training is not a strong systemic barrier to improve safety.

- pH testing of aspirate whilst a reliable process when performed correctly, the result may be influenced by feed/medication once 24hour feeding has commenced.

This is a safety risk that is possible in other providers where NG tubes are inserted to administer fluids, food and medications. Given this serious and ongoing safety risk could happen again, HSIB has taken the decision to make an early safety observation:

Interim Safety Observations

Safety observation O/2020/056:

It is important that organisations are aware that there is not a standard scale/colour scheme across the different manufacturers of CE marked enteral testing strips and they vary in scale (pH of 1-12, 0-6, 2-9 or 3-7). If organisations have CE marked enteral pH testing strips from more than one manufacturer in use at the same time there is still a potential for error if a pH testing strip is compared against the incorrect box.

Safety observation O/2020/057:

It is important when transitioning between any types of bedside testing equipment (not just pH strips) the potential for confusion between old and new stock is considered, and the transition managed to reduce that risk and to ensure that staff understand any difference between techniques needed with past and future brands of bedside tests.

Identified Safety Issues

The investigation identified there is on-going research to find a reliable design solution to reduce the risk of misplaced NG tubes. The learning that could be gained from a full national investigation was, therefore, limited. A decision was made to conduct a concise national investigation.

The concise national investigation will apply a human factors approach to understanding the processes,

practices, interactions among people and other elements of system performance involved with the insertion of nasogastric tubes and confirmation of their position. The investigation will consider existing guidance as well as the procurement and implementation of the equipment required for nasogastric tube insertion and confirmation, and how staff acquire the competencies to do this safely.

Next Steps

The HSIB will investigate the safety risks and welcomes further information which may be relevant, regardless of source.

The HSIB will report any significant developments as the investigation progresses.

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