Radiographer Responsibilities in Imaging Patients with NG tubes in situ

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Learning objectives

This poster aims to draw attention to the important issue of imaging patients for NG (naso-gastric) tube placement checks. Naso-gastric tubes (NG) are used commonly in hospitals for enteral nutrition and/or decompression of the small bowel or stomach and thousands are inserted in the National Health Service (NHS) in the United Kingdom each year without any problems or safety concerns. However about 5% are misplaced and incorrectly placed NG tubes have been seen to have devastating consequences for patients, with serious harm or death being reported by the National Patient Safety Agency resulting from incorrectly sited NG tubes, and these adverse incidents fall under 'never event' categories of events which are events that are defined as being those that should never be allowed to happen and have the potential to result in serious harm or death to a patient. Other 'never events' include wrong site surgery or wrong implant or prosthesis insertion for example.

This poster aims to educate radiographers and other staff group about the topic of NG tubes in general, their uses, the safety concerns surrounding them. It will focus on radiographers' duties when imaging these patients and also the role that radiographers can play in preventing never events caused by misplaced NG tubes. It will examine the literature and national guidance that exists in the UK to establish the duties of the radiographer and the radiology department when imaging these patients to help prevent NG tube misplacement never-events to occur.
Background

This topic was selected for presentation in a poster format as it is a vitally important topic to be aware of not just for radiographers but for the wider healthcare team to prevent harm to patients and ensure patient safety. Feeding a patient via a misplaced NG or nasogastric tube is defined by the National Patient Safety Agency (NPSA) as a 'never event', that is, one that should never, ever be allowed to occur and having serious untoward patient safety concerns\(^2\). Never events include other adverse incidents such as wrong site surgery, wrong route administration of chemotherapy or wrong implant insertion for example and are defined as unacceptable and eminently preventable incidences that should never be allowed to occur\(^2\).

Despite this, the devastating consequences of incorrectly placed NG tubes have been seen in the past. Between 2005 and 2010 twenty one deaths and seventy nine cases of serious harm were reported from incorrectly placed fine-bore feeding tubes\(^3\). One case that occurred in 2009 whereby a junior doctor in the middle of the night misinterpreted an NG check X-ray and a patient died following feeding through a NG tube sited in the right lung. Some root issues identified key problems such as limited radiology involvement, lack of image interpretation training, casual approach to NG intubation, poor standards of documentation, and NG checks being undertaken during the night\(^3\). The National Patient Safety Agency issued a patient safety alert in 2011 to draw attention to serious issue of NG tube placement and of harm caused by incorrect NG tube placement by stipulating that NG tube feeding should be justified and only undertaken when appropriate, NG placement should be delayed (e.g. not during the night where possible) to ensure experienced support is available, X-ray requests should clearly state that the purpose of the imaging is to check the position of the NG tube, and the individuals involved should have the theoretical and practical learning to be able to identify NG positioning correctly\(^3\).
Findings and procedure details

Radiographers need to be aware of a number of important points when requested to image patients for NG tube checks. The first pivotal point that radiographers should be aware of is the fact that as per the National Patient Safety Agency in the UK the first line method to ensure that an NG tube is in the correct place is the pH testing method and imaging is only recommended as a second line test only if needed.

A pH range between 1 and 5.5 is a safe range indicating that the NG tube is correctly sited in the stomach and therefore no further imaging is needed. ONLY if an aspirate is failed to be obtained, or the pH range failed to confirm correct placement should an X-ray be requested as a second-line test.

It is vital that all radiographers know this as when justifying X-ray requests, radiographers will need to know if a pH test has already been carried out and only if obtaining the aspirate failed or if it was outside the pH range can the X-ray be justified for NG check as per risk/benefit justification under the Ionising Radiation (Medical Exposure) Regulations 2006/2000.

Local policies

It is also very important for diagnostic radiographers to be aware of their local department procedures in place in relation to NG tube imaging. The NPSA also recommended in their 2011 safety alert that imaging patients for NG tube checks should only take place when there is sufficient experienced support to confirm NG placement at that in times where there may not be sufficient support (e.g. at night) then unless clinically urgent, placement should be delayed until that support is available and they suggested that local clinical services should establish locally approved staff guidance in relation to NG tube imaging. For example one study detailed that their policy was that imaging for NG tubes could only take place between 8am and 8pm where possible, imaging should take place within a target of one hour after the request has been made and the formal radiology report should be issued as soon as possible after image acquisition. Radiographers need to be aware of their own workplace policies in relation to imaging for NG tube placement. Prompt acquisition and reporting of X-rays is essential to reduce the risk of NG tube complications. Therefore all levels of radiographer who are working in the general department and who are involved in imaging patients for NG tube checks need to be aware of their local policies in relation to this.

Imaging:
When imaging patients for NG tube checks, the radiographer needs to ensure exposure is adequate so that the tube is visible at the bottom of the film, the image should be centred lower than normal to demonstrate the abdomen as far as possible below the diaphragm. A study published in 2017 auditing one particular imaging department assessing the visibility of NG tubes on portable chest X-rays found that on the first audit 85% of NG tubes were visible (although 10% were visible using image inversion techniques) and that 15% were not visible at all and that the tip of the tube was only visible in 54% of cases and worrying only 30% were centred lower than a standard chest X-ray. The NPSA in their patient safety alert stated that it is a radiographers duty to comply with the positional and technical guidance issued and that if this guidance is not followed, it will not allow accurate interpretation of NG tube placement and patients should not be allowed out of the X-ray department as it has obvious implications on patient safety risks and the potential of never-events occurring.

The NSPA also states that when imaging is being requested, that the X-ray request form clearly states that the purpose of the imaging is to check the position of the NG tube which is important to alert the radiology department when undertaking the images as the radiographer will have to ensure that the tip of the tube can be clearly visualised and also to ensure a comment on the NG tube positioning is included in the formal radiology report.

**Identifying misplaced NG tubes**

The NPSA advised that all involved in NG placement should be aware of the correct placement of the tube and should have the theoretical and practical training on this topic.

To confirm gastric position the NPSA advises asking yourself the following questions:

Does the path of the tube follow the oesophagus and avoid the contours of the bronchi?

Does it clearly bisect the carina and bronchi?

Does it cross the diaphragm in the midline?

Is the tip clearly visible below the left hemi-diaphragm?
Fig. 1: Example of correctly sited NG tube.

References: https://radiopaedia.org/articles/nasogastric-tube-positioning

Radiographer’s role in image interpretation

Advanced practitioner radiographers in the UK who have undertaken post graduate qualifications in image interpretation and in chest X-ray reporting are employed in many trusts in the UK\(^1,^5,^7,^8\) and therefore will need to be competent in NG tube checks and the duties that the NPSA have stipulated in relation to image interpretation of NG tubes that it the position must be detailed and also a comment must be made as to whether
they are safe to use for feeding\textsuperscript{2}. Radiographer reporting on NG checks was noted in one particular study which noted that in the studied department radiographers reported 64.5\% of X-rays for NG tube checks\textsuperscript{1}.

Recent studies have also shown that radiographers of other levels not just those who have completed chest X-ray image interpretation post-graduate courses should perhaps be more involved in NG tube checks in an effort to reduce the chance of never-events occurring and to ensure patient safety is maintained.

One recent 2017 study\textsuperscript{5} which examined 4,675 radiography examinations for NG tube placement found that radiographers who have completed in-house training on NG tube placement image checks had a 98.5\% accurate comment issued on the PACS system. Radiographers in this study were empowered after completing focused training on NG tube checks to issue provisional comments on the CRIS system and to also remove the tube themselves when they identified it was misplaced or alert the ward staff and getting them to advance the tube, with the thinking being that a few correctly placed tubes will inadvertently be removed but in the overall interests of patient safety and preventing never-events\textsuperscript{5}. The study suggested the role that radiographers could play in preventing never-events in relation to NG tube misplacement and improving patient safety as radiographers could be trained to interpret the image and immediately remove the tubes which are identified as being in the respiratory tract while the patient is in the X-ray department operating under the thinking of 'if in doubt, take it out'\textsuperscript{5}. While this role for radiographers is not widespread, and while most incidences of harm occurred by misinterpretation of NG tube checks by junior doctors and it is vitally important junior doctors are competent in NG tube interpretations\textsuperscript{5}, it does highlight that radiographers potential role as part of a wider healthcare team effort to prevent never events and should be encouraged to use their skills to prevent harm to patients.
Fig. 1: Example of correctly sited NG tube.

© https://radiopaedia.org/articles/nasogastric-tube-positioning
Fig. 2: Misplaced NG tube

Fig. 4: (A) The first AP portable chest x-ray shows an abnormally sited chest X-ray showed with the black arrows. The NG tube traverses along the course of the trachea and the right main bronchus and then overlaps the right abdomen. It needs to be removed immediately and not used. (B) The next AP image shows the chest after the NG tube is removed. It shows the appearance of mild right-sided pneumothorax (black arrow). The displaced pleural line can be seen by the white arrow.

Conclusion

In conclusion this is a very important issue to prevent patient safety incidences and to ensure that NG tubes are safe and effective for use. Radiographers need to be aware of their role and responsibilities when imaging patients for NG check X-rays. They need to be aware that the X-ray is a second line test as already mentioned and that the pH test should be carried out as a first line test and only if this is incorrect or if an aspirate is not obtained should an X-ray be requested. Radiographers need to take responsibility for ensuring that the tip of the x-ray is seen in order to allow the x-ray be accurately reported to confirm position prior to use. There are opportunities for radiographers to become more involved in the initial image interpretation and re-site of incorrectly placed tubes following training and local departmental support as suggested by recent studies as part of an effort to reduce never events occurring and ensure patient safety is maintained.
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References


