Using pH testing to confirm nasogastric tube position

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Abstract

In 2004 the MHRA published a directive for all hospitals in the UK to use pH paper in place of litmus paper when testing position of nasogastric tubes (NGT). This article illustrates one trust’s implementation of this process of change in order to achieve compliance.

In a two-year period from 2002-2004, 11 patient deaths associated with wrongly positioned nasogastric tubes were reported to the Medical Devices Agency. A UK-wide alert was published as a result in 2004 (MHRA, 2004). The guidance stated that blue litmus paper may not be sufficiently sensitive to detect whether nasogastric tubes were incorrectly positioned, potentially contributing to patient mortality.

It also stated that blue litmus paper should be withdrawn and replaced by pH testing and that all personnel involved in testing nasogastric tubes should be trained to use the new testing method.

Methods of confirming the position of NG tubes
To avoid complications clinicians need to determine the location of the tip of the NG tube before feeding is commenced (Neumann et al, 1995). There are a number of methods that are used to do this, and the ‘gold standard’ is seen as radiographic confirmation (Metheny et al, 1994).

However, this process involves either transporting patients to the X-ray department, or using a portable X-ray, either of which can delay feeding and mean unnecessary radiation exposure if a less invasive option is available.

Bedside testing was the first-line method for proving NG placement in the stomach and traditionally this was done by aspirating the tube once inserted and testing the aspirate with litmus paper. This turns from blue to red in the presence of gastric acid. In recent years, however, the Medical and Healthcare products Regulatory Agency has received reports of litmus paper being unable to detect that some NG tubes are wrongly positioned (MHRA, 2004). The National Nutrition Nurses Group (NNNG) then recommended pH paper as the safe alternative (NNNG, 2004).

Other less reliable methods have been used in addition to this, including auscultation of air through the tube (whoosh test) and monitoring bubbling at the end of the tube when placed in water, all of which the National Patient Safety Agency (NPSA, 2005a) have advised against. The agency expected all practitioners involved in the positioning of NG tubes to be compliant by September 2005.

Changing from litmus to pH paper
To manage this process of change in the trust, a baseline of evidence was gathered to assess current practice. At this time there was no formal trust-approved guideline, policy or protocol for the insertion of NG tubes or for confirming their position once inserted.

Some nurses used litmus paper after the initial insertion as a bedside testing method but radiological confirmation was more widely used as accepted practice. A huge culture shift had to be initiated, which would hopefully lead to a more successful change in practice. A trust guideline was proposed with opinions sought from representatives of practitioners involved in placing NG tubes and associated services and personnel (Box 1).

Implementation plan to achieve successful change
To implement change as smoothly as possible, the NHS Centre for Reviews and Dissemination (1999) suggested that consideration should be given to the following elements (diagnostic analysis):
- Identification of all the groups involved in, affected by or influenced by the change;
- Assessment of the characteristics of the proposed change;
- Assessment of the preparedness of the target group for the change;
- Identification of potential barriers and facilitators to the change.

Unforeseen events
The implementation plan appeared at first glance to be fairly comprehensive. The guideline was developed and accepted by the trust. The education process worked well and staff began using it. Unfortunately staff began highlighting difficulties...
they were having in using the new pH paper. Initially, it was thought that this was simply due to unfamiliarity and the consensus was to carry on using it. However, concerns were increasingly reported to the nutrition team.

The biochemistry department had advised the group on which pH paper to use and the decision was based on its effectiveness in predicting accurate placement (More et al, 1983). More et al (1983) compared the four main brands of pH paper and found that two brands were equally effective in successfully predicting the position of NG tubes. Although the chosen pH paper was based on good evidence, nursing confidence in its ability to provide a true reading was low.

In order to resolve this, one area was asked to undertake an audit to compare the existing brand of paper with the other leading brand identified by More et al (1983). Thirty patients were recruited and both pH papers were used to test the same aspirate obtained from NG tubes.

Both pH papers revealed very similar results and they were equally matched in effectiveness. However, when staff were asked the question: ‘In your opinion, which of the pH papers is more user friendly?’ one was ranked 16 per cent and one 84 per cent.

The reason for this was that one of the papers closely resembled the products used for testing urinalysis and staff were able to relate to this. Per- haps familiarity as well as the effectiveness of the paper and it is being successfully used. Linstead et al (1983) compared the four main brands of pH paper and found that two brands were equally effective in successfully predicting the position of NG tubes. Although the chosen pH paper was based on good evidence, nursing confidence in its ability to provide a true reading was low.

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The reason for this was that one of the papers closely resembled the products used for testing urinalysis and staff were able to relate to this. Perhaps familiarity as well as the effectiveness of the product was an important facet that was missed when trying to implement successful change.

Since then, the trust has adopted this brand of paper and it is being successfully used. Linstead et al (2004) support this and advise that participation and involvement in change is implicit in achieving success. In hindsight, our own trial to compare the two leading brands (and not simply accept advice offered to us, however well evidenced) should have occurred before rolling this out to the whole of the trust. This was a valuable lesson about the power of local evidence when instituting change.

Another problem was that paediatric and neonatal nurses were more apprehensive about the change. Paediatric nurses were concerned about the volume required to see a change of colour on the pH paper, however, this was managed by asking them to be the area responsible for performing the audit comparing the two brands of pH paper.

This created successful ownership of the audit as the nurses could see for themselves that only a small amount of aspirated fluid was necessary to effect a reaction on the pH paper. This again gave a powerful local message to staff that it could be used successfully in their area.

At the time the neonatal unit decided not to change their testing methods for confirming NG tube placement until after a consultation exercise had been completed with the British Association of Perinatal Medicine, the NPSA, the Neonatal Nurses Association and the Royal College of Paediatric and Child Health, as preterm babies can have significantly higher pH values (Kuusela, 1998). However, current guidance published in August this year (NPSA, 2005b) advises that pH paper is now to be implemented in neonatal units nationally. In addition, advice and a framework for risk assessment is given to guide staff about what to do if the aspirated pH exceeds the report’s recommendation of <6. Practitioners are expected to comply with these recommendations by 1 January 2006 in all neonatal units across the country.

**Conclusion**

This process of change was far from straightforward and problems were encountered during the implementation. This was because there was no previous guidance on testing NG tube positioning in the trust and a disparity in practices was discovered when attempts were made to implement guidance based on a national directive from the MHRA (2004). Change was required at individual, group and organisational levels and it was a difficult task to achieve.

In order to make the change process effective, the author recommends enlisting a core group of staff who actually insert NG tubes and will use pH paper testing as well as staff from other disciplines with a vested interest, such as the biochemistry and education teams. Nominated representatives from each area can feed back to their colleagues.

With the benefit of hindsight, the author can also see that it would have been better to have undertaken a pilot study to trial the effectiveness of the guideline. This should take place in a particular area in order to avoid the situation that arose whereby the pH paper, although proving

**References**


very effective, failed to gain the confidence of many of the nurses. A different brand that nurses were more comfortable with was therefore introduced after eight months. If a product process is more likely to fail (Williams et al, 1993).

The author chose to perform an audit comparing two leading brands of pH paper. The favourite was then adopted by the trust and because it was evidence gained locally, it appeared to give nursing staff more confidence. The staff felt they had ownership of the guidance and this was key to its successful implementation and adoption.

Lessons learnt
It is important not to underestimate the power of local knowledge as this is the best tool in ensuring that staff will take ownership of any change, making it more likely to be successful.

Also, staff should adopt a flexible approach and build natural stopping points into the process of change to ensure that the methods used to achieve it are appropriate. Lock (2001) suggested that if any corrective measures are needed in managing change it is essential they are identified early.

Therefore, pre-arranged ‘time-outs’ involving all of the original groups’ members, and any of the suggested new ones, are necessary to achieve successful change.

References


box 2. Key implementation points

- Identify which staff groups need to be involved
- Discuss how national recommendations can be developed into local guidelines
- Develop subgroups to look at needs of adults, paediatrics and neonates
- Develop this within the staff groups, incorporating any comments.
- Trial pH paper and audit results
- Obtain agreement on clinical risk and clinical governance
- Build in stopping points in order to review progress (dates)
- Use staff groups as clinical leads to update their own areas, supported in this by the education team
- Disseminate to all matrons at ward meetings and publish on intranet
- Educators to use same training package for the trust
- Nutrition nurse to organise informal and formal study sessions