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Hywel Dda University Health Board

**Evaluation Report
NGPOD real world evaluation**

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Who We Are

In 2021 the TriTech Institute was launched. We are a team based in a bespoke facility within the Hywel Dda University Health Board comprising of industry-leading engineers, scientists and clinicians.

Our Institute

Here at TriTech Institute, we support the development of healthcare solutions on a local, national, and global level offering designers and manufacturers a single point of access to the NHS through a collaborative and agile approach.

What We Offer

The team's advanced skills in clinical and research design are combined with technical engineering expertise to manage the whole innovative pathway from early unmet need, through to concept design, prototyping, clinical testing, and real-world service evaluations.

Our Services

We provide specific services and solutions for clinical engineering, research and innovation and Value-Based healthcare and can also support with grant writing and submission.

Executive summary

This report covers the period of 10/01/2022 to 21/09/2022.

Background

Nasogastric feeding tubes are used when patients cannot swallow food, liquids, or medication safely. After insertion, national guidance requires that clinicians confirm that the nasogastric tube is correctly placed before each time they are used. The current test that confirms correct placement relies on obtaining fluid (known as aspirate) from the tube and tested using pH test strips. Testing is vital as an incorrectly placed tube (most common misplacements are curled up inside the upper airway or placed into the main bronchus in the lung) can have immediate and serious consequences including severe injury or death. The current pH testing regime can be unreliable, time-consuming, and often still requires an X-Ray to confirm pH results. Such testing methods often delay feeding treatment or the ability to give medications in a timely way, which all combines to increase inefficiencies within a healthcare setting and lead to more staff and patient anxiety. There are also well-documented human and technical factors associated with the current confirmation methods, leading to errors, delays, and increased risk.

Situation

As a result, a new technology has been developed, the NGPOD device, aimed at simplifying and improving the pH testing for nasogastric tube placement. The NGPOD technology has been shown to reduce the number of confirmatory X-rays and delays to feeding and administration of medication within a controlled research setting- against standard pH testing protocols. [14] Following this finding we carried out real world clinical evaluations on the management of nasogastric feeding tubes on two stroke wards, one at Morriston Hospital, Swansea Bay UHB (Wales, UK) and one at Glangwili Hospital, Hywel Dda UHB (Wales, UK). Our evaluation was over a five-month period and assessed the NGPOD device's ability of measuring pH to verify the correct placement of NG tubes in patients in real world settings instead of a controlled clinical research study. The evaluation looked at implementation, useability, and clinical impact of the device on the wards.

Findings

21 patients had NG tubes placed on the Stroke ward at Morriston Hospital and 8 on the Stroke Ward at Glangwili Hospital. Data was collected on the use of NGPOD, and any additional need for pH testing, x-ray requests and any delays to feeding/ medication. Staff were interviewed face-to-face and through on-line/paper surveys. NGPOD was found to be effective when using the device for the intended purpose and using it as per the manufacturer's specified conditions and instructions for use. It was also found to be acceptable and useable by the staff. However, we identified several barriers around the current infrastructure within the health care system surrounding the implementation of new technology. The main findings of the evaluation have been divided into three key themes, Technology, Infrastructure & People and these are summarised below:

1. The Technology Evaluation

Overall, we found that the technology worked well; it appeared accurate with no major errors. NGPOD was found to be effective when using the device for the intended purpose and using it as per the manufacturer's specified conditions and instructions for use. However, we did find several cases of the technology not being used correctly through human error including, the wrong-sized probes being used, not using the NGPOD probe for long enough and trouble passing the probe through certain NG tubes. We also found that in both evaluations, the evaluation outline was not followed exactly with NGPOD not being used as much as it should have been. The reasons for these issues were caused by a lack of understanding around the device and also due to staffing and training issues within the departments.

2. The Infrastructure Evaluation

Most staff identified the potential for NGPOD to help their service. The main barrier reported by staff, was lack of confidence or understanding about how the device worked. Additional support after the initial training with the installation team was identified as a key enabler. Solutions to enable the effective implementation should focus upon protected time for clinical staff to learn how to implement the device but importantly also follow-up sessions to monitor and troubleshoot, during and after the implementation. Lack of time, difficulties in finding the key people to talk to, difficulties in sign-off, variability on service design and especially service oversight/management meant a lot of time was needed by the company and evaluation team to setup and considerable support was required during the evaluation.

3. Staff Evaluation (People)

Feedback around the device was in the main positive, and the majority of staff were highly satisfied and were keen to continue using NGPOD, however, they still advocated for pH strips to remain as a back-up or alternative method. The main recurring barriers were the perceived lack of understanding on the key operating procedure of the device (training and experience).

Conclusion

NGPOD was found to be effective when using the device for the intended purpose and using it as per the manufacturer's specified conditions and instructions for use. It takes as long as standard aspirate testing and reduces the need for x-rays in a real-world setting. The evaluation indicated that despite the effectiveness of the technology more structure and support was needed around the implementation of the device. This includes leadership and ownership of the device within the hospital and development of a competency-based training program within the health board that includes education of its use and mode of operation. Additional work may be required on cost effectiveness and impact upon staff time, but this centred on some of the issues around correct implementation of the real-world evaluation rather than the technology itself.

Key recommendations

From the results of the evaluation several key recommendations have been identified. Primarily the recommendations centre around the infrastructure within the hospital and upon training and oversight.

Recommendation 1: Training Program (Infrastructure)

More contact, guidance and oversight following the initial training would be needed to implement and scale NGPOD in the real world. We strongly recommend a focused strategy on more intensive training, including competency-based assessments and regular refresher training based on the ward. Training should involve observation of actual use on patients to build confidence (not just video) and real-time checks that people are using the technology correctly. In addition, posters, and further training material should be readily available on the ward to act as refreshers. Any initial training should be carried out in a staged fashion and over a few weeks to support understanding and learning. This training should be the responsibility of the health board / trust with initial input and oversight from the company. The health board / trust will need to draw up a set of protocols or standard operating procedures around competency and the provision of structured training program.

Recommendation 2: Training Champion (Infrastructure)

As part of the training program, we recommend that the health board / trust need to appoint either a specialist point of contact for staff within the Health Board (or on the ward) who can act as a 'champion' or super trainer within the organization responsible for the training of staff. It would be the responsibility of this person or team to support staff in their individual training needs and troubleshoot any clinical or technical issues. They will also be instrumental in raising awareness of the technology across the hospital system to allow for a smoother transition.

**Recommendation 3:
Environment and Accountability
(Infrastructure)**

In addition, for the device to be successfully adopted within a hospital, focused support is required from management and senior team leaders in the health board and on the ward. This would hopefully alleviate any anxiety and provide encouragement and confidence in the use of the device. It would also be important for the leadership teams to have protected time needed during the implementation and training requirements of the device on the ward to ensure the device is embedded correctly and is visible across the hospital.

**Recommendation 4:
Early Exposure and Training (Infrastructure)**

For the acceptance of new devices, it is important that these technologies are also adopted early by newly qualified and trainee staff to encourage cultural change so that they become a part of standard and routine care. Our recommendation is that the health board / trust ensures that pre-registration nurses are also shown and trained in using the NGPOD device for pH testing of NG tubes. This should also include agency staff where possible.

**Recommendation 5:
Wider Adoption (Infrastructure)**

In the current working environment of the NHS there is considerable movement of staff across wards (and health boards) and a large dependency on agency staff, it is recommended that the device is adopted across all the wards at a hospital (or across an entire health board). This will ensure that more people are aware and comfortable with using the device and will ensure better use of resources.

**Recommendation 6:
Labelling (Technology)**

Several staff noted difficulties identifying multiple types of NG tubes. It can be very difficult to identify the correct probe, or a particular tube just by viewing the probe packaging. We suggest a colour coded system with a key-chart (akin to oxygen masks) matching the suitable NGPOD probes to each size of tube.



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Abbreviations

NGT	Nasogastric Tubes
ED	Emergency Department
GP	General Practitioner
HDUHB	Hywel Dda University Health Board
SBUHB	Swansea Bay University Health Board
NHS	National Health Service
R&D	Research and Development
MH	Morriston Hospital
GH	Glangwili Hospital

Acknowledgements

A note of sincere thanks to all staff at both Morriston and Glangwili Hospitals who were involved for their time and contributions to this evaluation, through interviews, surveys and by providing information and feedback.

We would also like to thank Marcus Ineson and NGPOD Global for their time and support.



Situation

Background and Context

Nasogastric (NG) feeding tubes are a commonly used procedure for both adults and children in many disciplines and settings within healthcare the world over. They provide a vital intervention in ensuring patients who cannot or have difficulty in swallowing receive lifesaving hydration, nutrition and medication. Within the NHS alone its approximated that at least 1 million NG tubes are used annually.[1] Despite the fundamental benefits they provide there are also significant risks including serious injury or death, if used incorrectly or if the NG tube is misplaced. [2]

Current Guidelines & Recommendations

For an NG tube to work they must be placed correctly. This involves ensuring the distal end of the tube is delivered into the stomach of the individual so that all materials passed through the tube end up in the correct place (see Figure 1). The main concern in NG tube management is the misplacement of the tube into the respiratory

tract (see Figure 2), and if feed, flush or medication is then delivered into the lungs, this can lead to serious or fatal complications. Events such as these are classified in NHS England and Wales as patient safety 'Never events'. Where a Never Event is defined 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'. [3] Current guidelines in the UK (and worldwide) indicate that on any placement of an NG tube its correct positioning must be confirmed before any fluid, feed or medication can be passed through the tube. In addition, guidelines dictate that the correct positioning of the tube should be rechecked before any new feed, flush or medication treatment is started.

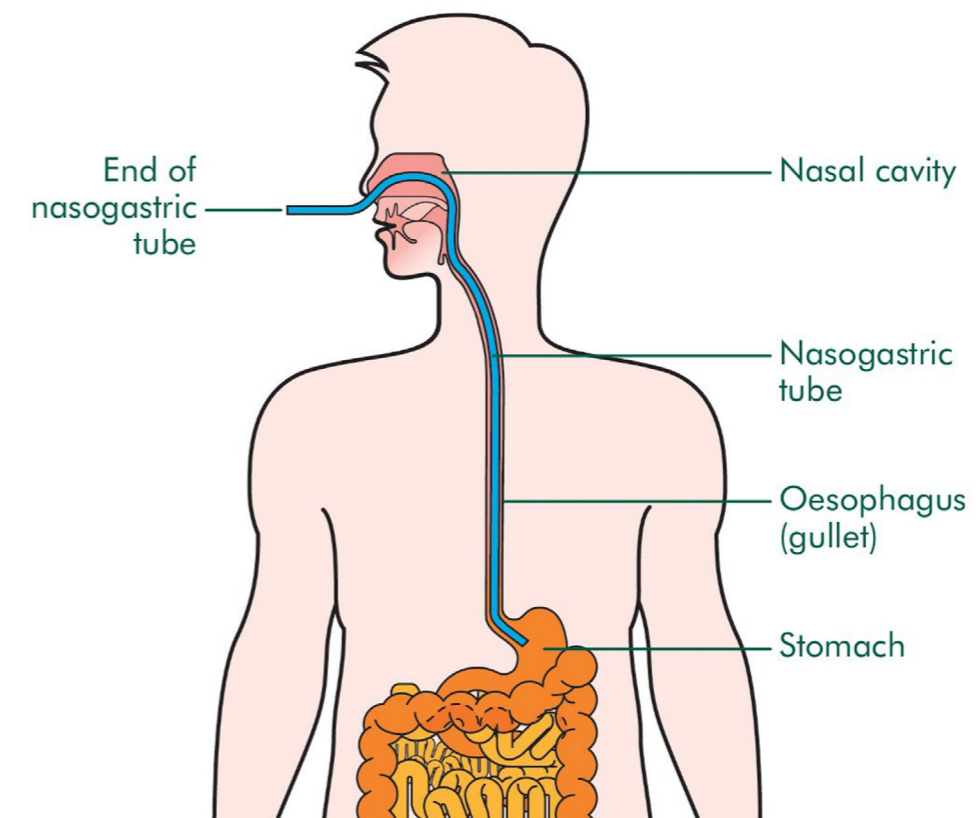


Figure 1: Diagram of an NG tube placement (from www.fromnewtoitu.com).

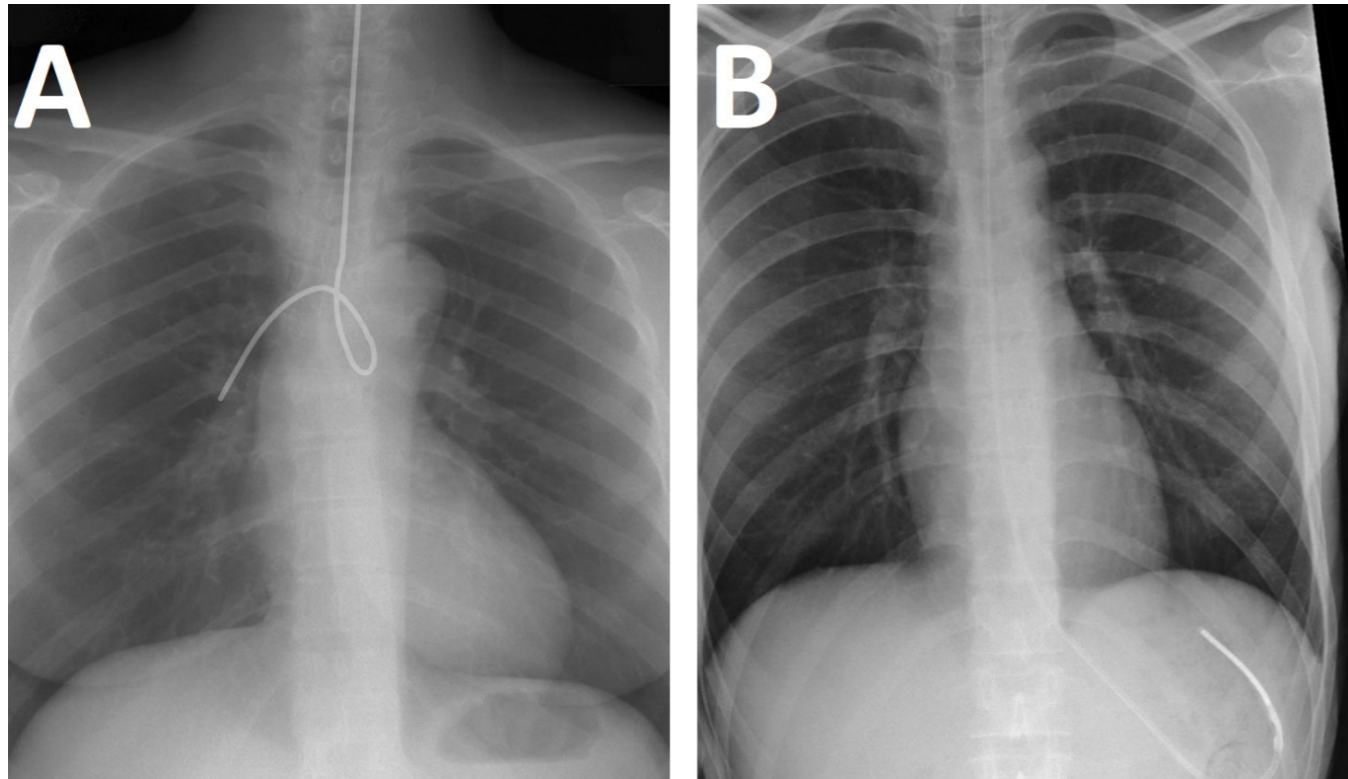


Figure 2: Two images of chest x-rays with image A showing an incorrect NG tube placement (tube coiled in the Tracheobronchial Tree) and image B showing correct placement (to the correct length) of the NG tube.

Current Procedures for Confirmation of Correct Placement

Determination of correct placement for an NG tube is not simple, as most placements are 'blinded' where visual determination is not possible. To address this, guidelines and best practice indications from most organisations and associations worldwide advocate the use of pH testing as a first-line procedure for confirmation of correct placement.[5] As the tube must be located in the stomach, testing the environment that the tip of the tube is located in is an effective method for determining correct placement, where any indications of a pH below 5.5 would determine that the tube is in the correct place.[6] The current procedure for pH testing is to obtain aspirate from the distal end of the tube, via 'sucking' up fluid through the tube and then testing the pH using specialised pH strips, where a pH indication of anything between 1 to 5.5 indicates it is safe to administer nutrition, hydration or medication. As a second line of confirmation if the pH cannot be obtained, 'if no aspirate could be withdrawn from the patient', the use of x-rays can be used to confirm correct NG tube placement.[7]

"...both pH testing and use of X-ray are prone to error..."

"...using pH testing strips is potentially unreliable and its complexity underestimated..."

Quotes from the NHS England, Healthcare Safety Investigation Branch report into nasogastric tube placement (Dec 2020)



Current Unmet Clinical Need or Clinical Dilemma

One of the main issues with the current pH testing of aspirate is despite it being a simple procedure, success in obtaining aspirate can range from 54% to 80%. [8-9] In addition, studies show that even when sufficient aspirate is obtained, pH strips fail to provide a clear outcome 12-30% of the time,[10] resulting in errors in pH value interpretation. pH testing and the interpretation of pH strips is a large cause of anxiety in health care professionals carrying out this procedure. [5] The National Patient Safety Alert (NPSA) in 2016, identified that of 95 NG tube-related 'Never Events' that occurred in the preceding 4.5 years, 23 were related to pH testing using pH strips.[11] There were also some concerns around the use of X-rays as a second line. Despite X-rays being the Gold Standard method to determine NG tube placement, interpretation and reporting errors regularly occur [12,13] with the majority of 'Never Events' related to NG feeding associated with the misuse or misinterpretation of the x-ray. [11]

The primary issue with the current testing is 3-fold, one the large variability between different hospitals in their success in obtaining aspirate. Furthermore, if aspirate is not obtained, significant delays to feeding can occur. Sending patients for x-ray can delay treatment by several hours, exposes patients to radiation and increases testing costs. For some patients where there is an inability to obtain aspirate over several days, there can be repeated exposure to x-rays. There are major limitations to the use of the current technology and methodology in checking NG placement. Therefore, any changes to the current NG guidelines must consider:

- A highly reliable test that has a high success rate of obtaining a pH reading.
- A test that is easy and simple to use.
- A test that reduces the need for x-ray referral.
- A test that minimises any delays to feeding or medication for the patient.

NHSI asked in 2016, "...what alternative technologies could be explored?" to improve safety in NG tube feeding, this study is to determine whether NGPOD® is a potential step forward regarding this.

NHS Improvement. Resource set Initial placement checks for nasogastric and orogastric tubes. July 2016

Solution: A New Technology

To address this clinical dilemma NGPOD Global have developed a new device, NGPOD®. The NGPOD® device can be attached to a one-use fibre-optic flexible sensor (coated at the distal end with a hydrophilic pH indicator compound), that can slide down and reach the distal end of the NG tube (see Figure 3). The NGPOD® device can then be used to determine the pH of the environment at the end of the NG tube and will indicate whether the pH ≤ 5.5 and that the tube is placed correctly. The NGPOD® fibre-optic sensor is coated at the distal end with a hydrophilic pH indicator compound. The sensor connector is attached to the NGPOD® device, which, when activated, sends a pulse of LED light to the indicator compound at the distal tip of the sensor. The software in the NGPOD® device reads the wavelength of returning light. If a green or yellow wavelength is detected signifying a pH ≤ 5.5 , the device will display a green LED, indicating a pH at the tip of the NG tube within the safe range for the NG tube to be used [14]. If a blue wavelength is detected signifying a pH > 5.5 , the device will display a red LED indicating that the tip of the NG tube may not be in the stomach and that the NG tube is not safe to use unless correct placement is confirmed by other means.

Clinical Research

A clinical research study using the NGPOD indicates the handheld device overcomes many of the risks associated with existing

nasogastric placement confirmation methods. The study was structured to recruit sufficient subjects to include 100 first insertion checks (immediately after insertion of NGT) and 500 repeat NGT position checks (before use), with a maximum of 10 tests on each patient.

Earley et al [14] compared the use of NGPOD versus aspirate and pH testing for nasogastric tube (NGT) confirmation. The research shows that NGPOD significantly reduced the need for chest x-rays, by up to 62% immediately after tube placement, and by 16% when using NGPOD for repeat testing. The key benefits of the NGPOD device included:

- No aspirate required
- No interpretation. Get a clear "Yes/No" answer.
- Rapid result [c.20 seconds]
- Reduce delays to patients' treatment, hydration and nutrition
- More cost-effective than using aspirate & pH strips first line

They concluded that NGPOD, was as accurate as aspirate pH strip testing, and able to deliver a result when it is not possible to obtain aspirate. This is an important factor in the ease of use and ability to deliver a clear and actionable result on general wards and in ICU, where NGPOD can reduce risk, improve safety, and decrease the numbers of patients requiring X-ray. It has the potential to reduce 'Never Events' associated with NGT misplacement.

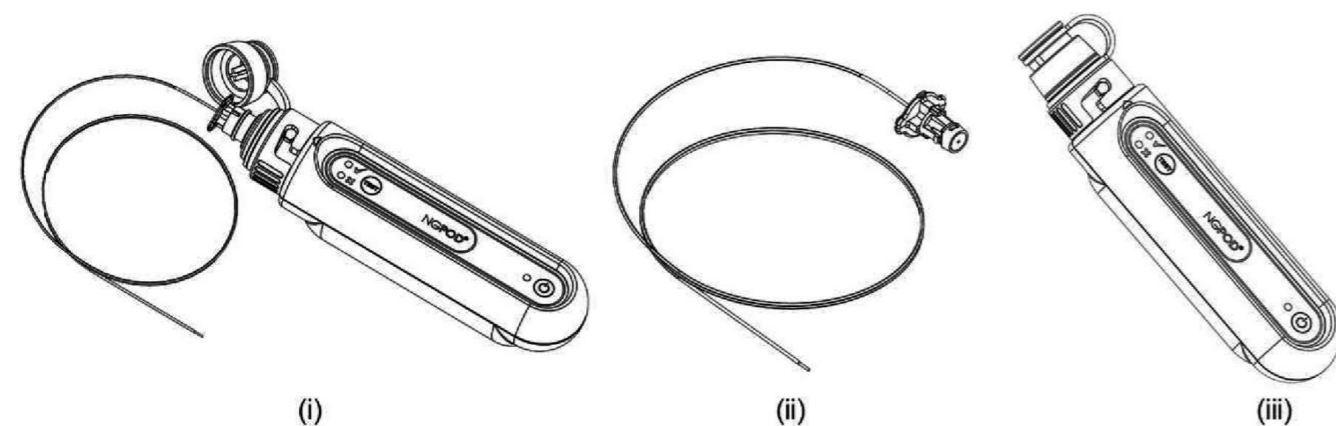


Figure 3: NGPOD system. NGPOD is composed of two elements, a fibre-optic sensor (ii) and a hand-held electronic device (iii). NGPOD, novel fibre-optic pH test device.

Rationale and Aim of the 'Real World' Evaluation

These initial studies around NGPOD have all been carried out in a controlled research environment. NGPOD has shown favourable results when compared to the standard aspirate testing in this setting. We performed a service evaluation in a real-world clinical setting in stroke units at two district general hospitals in Wales over a 5-months. The evaluation explored the barriers and facilitators to implementation and adoption within the NHS healthcare system and pathways. This evaluation explored staff perspectives of the device and its useability. The evaluation(s) as a whole was planned to identify the effectiveness of the NGPOD device in the real-world.

Methodology

Evaluation Introduction

In 2022 Hywel Dda University Health Board's (HDUHB) Trittech team was commissioned by NGPOD Global Ltd to evaluate NGPOD at:

- Ward F, Morriston Hospital, Swansea Bay University Health Board
- Gwenllian Ward, Glangwili Hospital, Hywel Dda University Health Board

This evaluation covers the period 01/05/2022 to 21/09/2022.

Evaluation Objectives

We used a mixed-methods approach to evaluate the objectives outlined below at both sites:

Objectives:

1. **Technology:** To test the safety and accuracy of the NGPOD device to measure NG placement.
2. **Infrastructure:** To identify the barriers and facilitators around the implementation and use of NGPOD.
3. **People:** To record staff (user) perceptions on NGPOD.

Data Collection

Trittech engaged with the clinical stroke teams and managers via weekly site visits.

Quantitative data collected from the service

The data included:

- Number of patients undergoing initial NG tube placement
- Number of pH Tests completed
- Using NGPOD for ongoing placement checks
- Tests completed using aspirate
- Number of pH tests required in total (and per patient)
- Time taken to get a result using pH testing with NGPOD (or aspirate)
- Number of tests resulting in a green (correct NG tube placement) or red (potential incorrect NG tube placement) results or unable to insert with the NGPOD device for each pH test performed
- Number of X ray referrals requested following NGPOD test
- Time of nutrition/hydration/medication prescribed
- Time of nutrition/hydration/medication administered
- Time of X-Ray request by doctor
- Time of X-Ray reported in medical notes
- Description of events

Qualitative data collected from staff

Trittech sent a survey to staff during the last 3-4 weeks of the project (Appendix 1). Trittech interviewed 6 staff over short 30-minute interviews to capture differing viewpoints and experiences on using NGPOD. The staff interview schedule can be found in Appendix 2.

Questionnaire and Interview information to include

The data collection from the staff survey and interviews focused on gaining the service providers perspective on NGT management, using the NGPOD device and any barriers or enablers for the implementation of pH devices in NGT management. The topics discussed included:

- Experiences of pH testing
- Previous confidence around feed based on pH testing
- Perspective on current service in NG tube placement testing
- Experience in using the NGPOD
 - Ease of use
 - Speed of use
 - Confidence in feed based on test results
 - NGPOD Training materials effectiveness
- Attitude towards the NGPOD device
- Preferences in pH testing
- Perspectives on how well the device was tolerated by the patient and the overall perceptions on the patient experience whilst NGPOD is being used.

Data Analysis

The data was collected and analysed for both sites to:

- Breakdown and provide detail on the current NG feeding tube service, using the NGPOD device. Summarising and analysing the data collected around NG tube type, NGPOD usage, x ray referral and delays in feeding/hydration/medication.
- Provide a summary and analyse the findings of the staff feedback survey(s) detailing staff experiences with pH testing, using NGPOD, and feedback on the NGPOD device.
- Provide a summary of the findings of the staff interviews for user perspectives on the NGPOD device and provide the detailed pros and cons.
- Provide potential recommendations around using the device in the future.



FINDINGS

Swansea Bay University Health Board Ward F Real World Evaluation

Period: 01/05/2022 to 14/08/2022

Ward F, Morriston Hospital - Swansea Bay UHB

Overview of the Stroke Service

Service Overview

The stroke service at Swansea Bay UHB assesses acute stroke patients presenting to the Emergency Department, facilitating early imaging, assessment, diagnosis, and treatment and ensures a smooth patient journey from ED to the Acute stroke unit. As well as clinical work, the service is also involved in audit, teaching programmes, including running in-house and regional simulation workshops and research.

The stroke service at Morriston Hospital, Swansea Bay UHB sees around 600 acute stroke patients who present to Morriston hospital each year. Of these, close to 400 are admitted and treated on the 24 bed Ward F stroke ward. Over a calendar

year Ward F has a total of 4,380 shifts, based on 3 shifts per 24 hours, 4 qualified nurses to each shift. Between 1/10/2021 and 1/10/2022 Ward F had a total of 872 agency staff nurse shifts, accounting for around 20% of the Wards staffing needs. These numbers do not account for the shifts where they were short and only had 3 nurses on shift.

As part of their service, the stroke ward nursing team are responsible for managing and delivering their NG tube feeding procedures on the Ward. Ward F sees between 30-60 patients who require feeding and medication to be delivered via an NG tube a year.

NG Tube Management Service Objectives

NG tube management at Swansea Bay UHB is dictated by their standard operating procedure and policy for the health board (<https://sbuhb.nhs.wales/.../7a-appendix-2-ng-policy-pdf/>).

How will NGPOD be introduced to the service?

For the evaluation it was stipulated that using the NGPOD will not change any of the standard operating procedures or policy documents outlined by the health board. It was stipulated that the only change was that NGPOD will be used to measure pH in place of the standard aspirate method. As per the evaluation protocol the senior staff agreed that NGPOD will be used as first line and will be used for initial placement and routine testing for the correct placement of NG tubes on the ward. It was agreed that only trained clinical staff, who are proficient in the use of the NGPOD will use the device (people not trained will continue to use the aspirate testing). In all cases the choice of pH testing will be ultimately left to the medical professional's decision.

Training of NGPOD

Initial NGPOD training was delivered by an approved NGPOD Global trainer, to the ward staff on 08/03/2022. The nurse ward managers and senior nursing staff were trained with the device, with the ability to train others. Secondary training was also delivered on 07/06/2022. Training of subsequent staff was the responsibility of trained ward staff, with extra training by NGPOD Global staff made available.

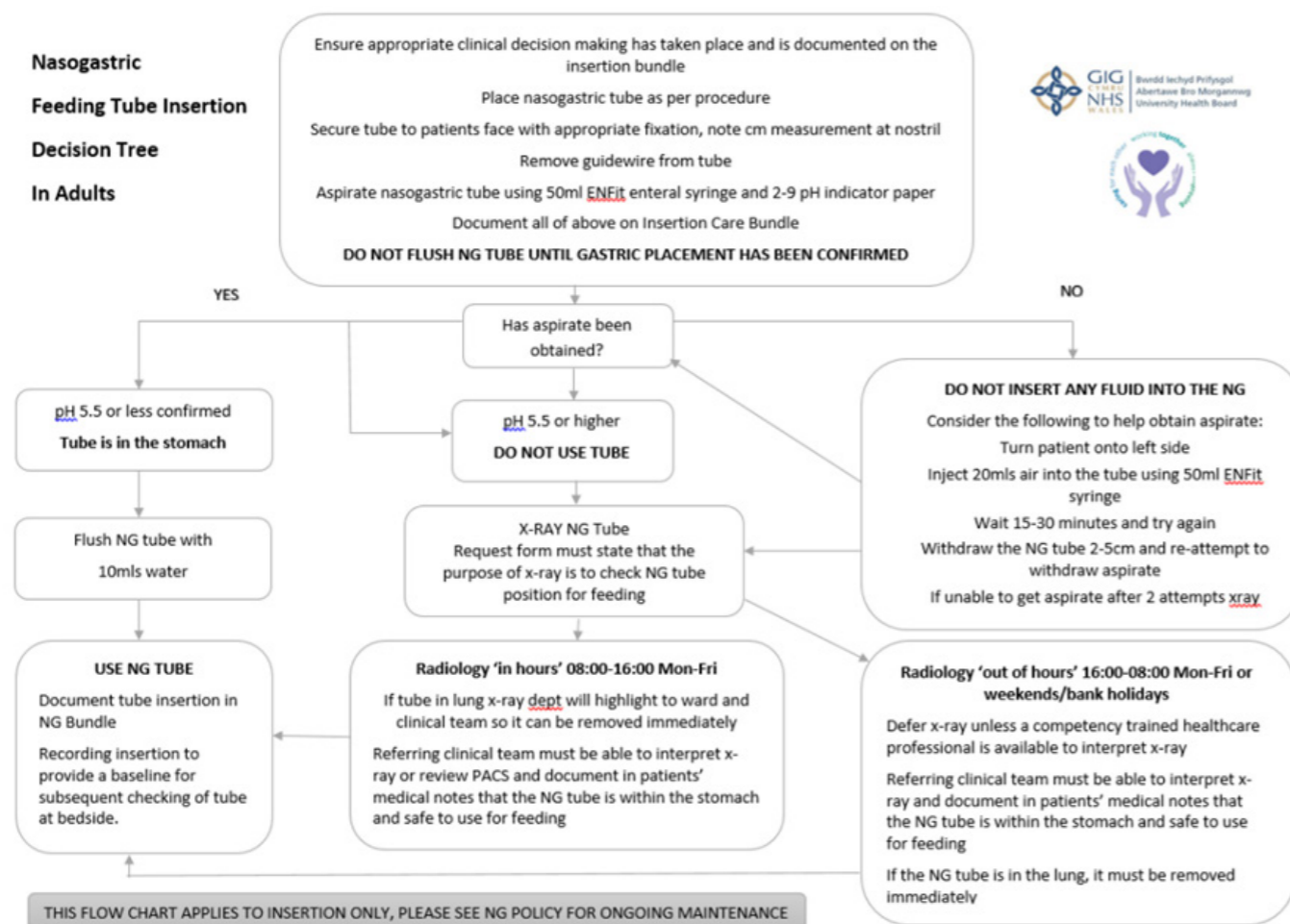


Figure 4: The Decision Tree for NG tube placement and management at Swansea Bay UHB.



Findings

Implementation

The evaluation was originally planned to run over 3 months starting on the 01/05/2022, however the project recruitment was extended by 2 weeks and finished on the 14/08/2022. Information for patients included before 14/08/2022 were still collected until no more NGT data was available for that patient. During this period a total of 21 patients needing an NGT were included in the evaluation.

Demographics & Recruitment

Demographics of the NG patients on Ward F are shown in table 1 below.

Parameters	Value
Age (years)	72.1±18.2
Gender Male (n, %)	61.5%
BMI	29.0 ± 7.1

Table 1. Demographics of NGT patients on Ward F SBUHB (n = 21).

Patient Recruitment

Patient recruitment was consistent throughout the duration of the evaluation, apart from between the dates 01/05/2022 to 14/08/2022) see Figure 5. During this period an unforeseen change to the type of NGT being used on the ward following a supply chain issue resulted in a different size of sensor being required for these new NGT which took 10 days to arrive.

The median time for the patients to have an NGT in place was 9 days (IQR of 4 to 15 days) (see Figure 6). With 2 patients only having the NGT for 1 day and one having an NGT for 25 days.

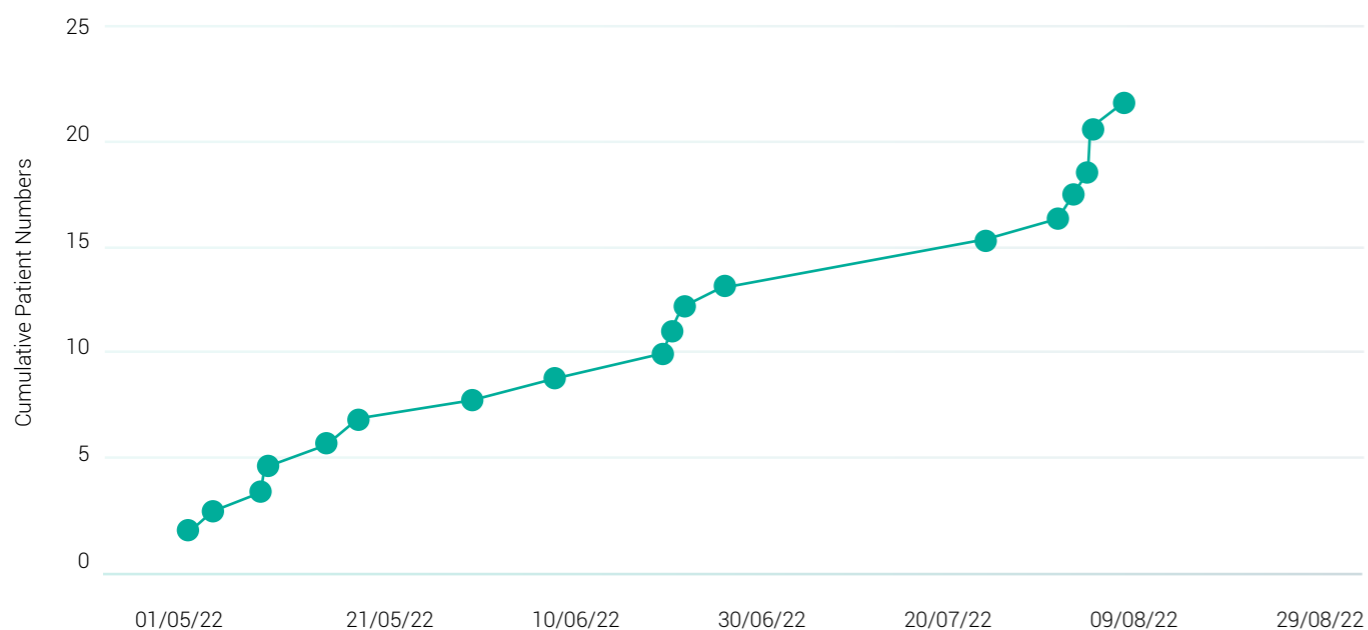


Figure 5: Graph showing the cumulative number of patients in the service evaluation.

pH testing

A total of 259 pH tests were undertaken. With a median of 7 tests (IQR 4 to 19 tests) performed for each patient (see Figure 6 & 7). Of all the pH tests undertaken, 140 of them were still performed using the aspirate method, of these 77% of them were accounted for by agency staff or staff who were not regular to the ward. However, this leaves a significant proportion of tests (32) that were done with aspirate by people trained with NGPOD. There were 79 tests undertaken with NGPOD alone and a further 35 where both tests were used. Therefore, a potential total of 67 tests were undertaken, against the study protocol or where NGPOD should have been used

alone. The rationale given for why aspirate was used instead of NGPOD was primarily due to staffing: with the ward being subject to staffing shortages, resulting in many staff who were not correctly trained to use the NGPOD device or upon investigation were not aware of its presence on the ward. The rationale provided for why both tests were used in some instances was that people who were being trained wanted to check both devices, however, this was still being undertaken at the end of the evaluation period.

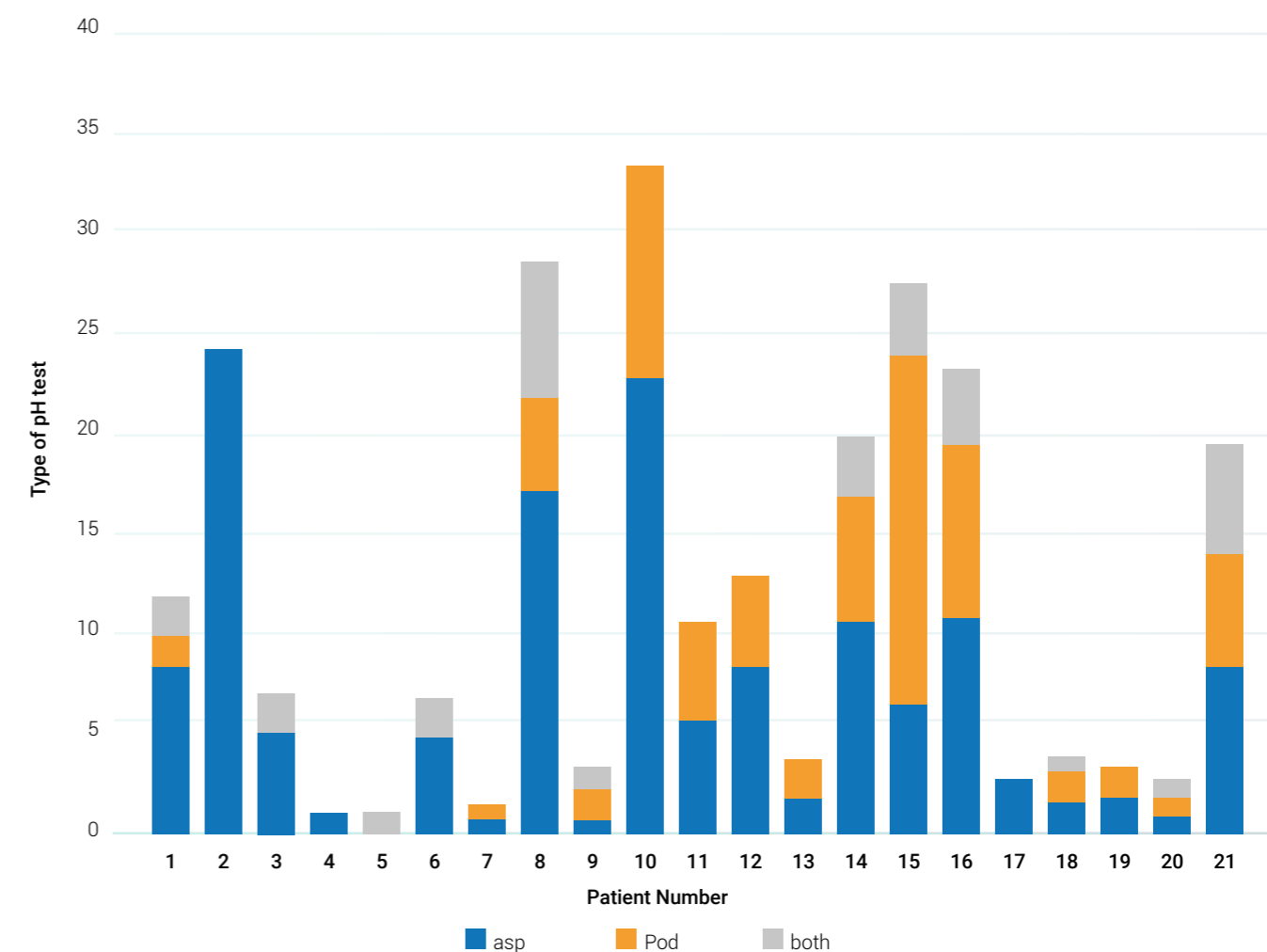


Figure 6: Graph showing the total number of days that each patient had an NGT in place or were under NGT management during the evaluation.

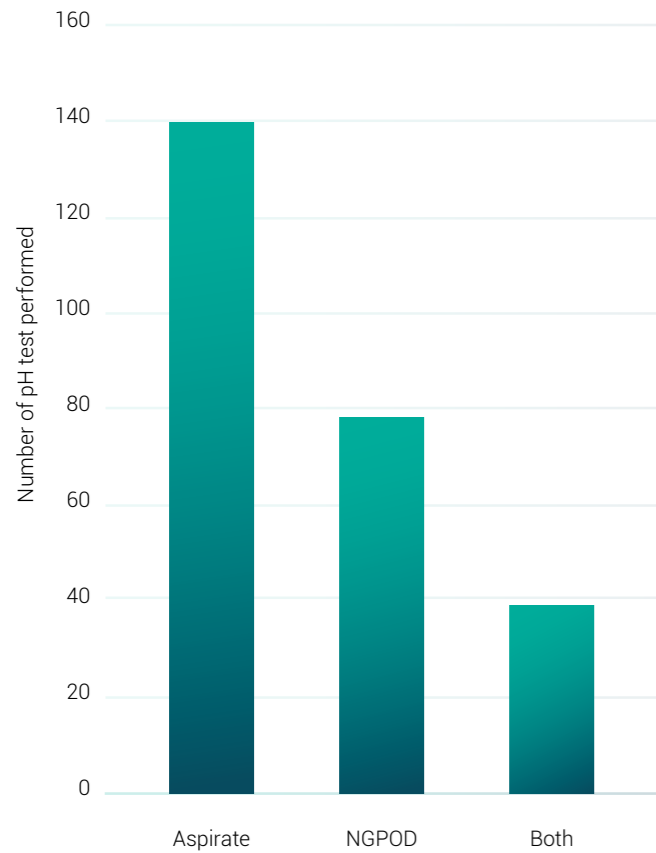


Figure 7: Graph showing the total number of aspirate and NGPOD tests done during the evaluation period.

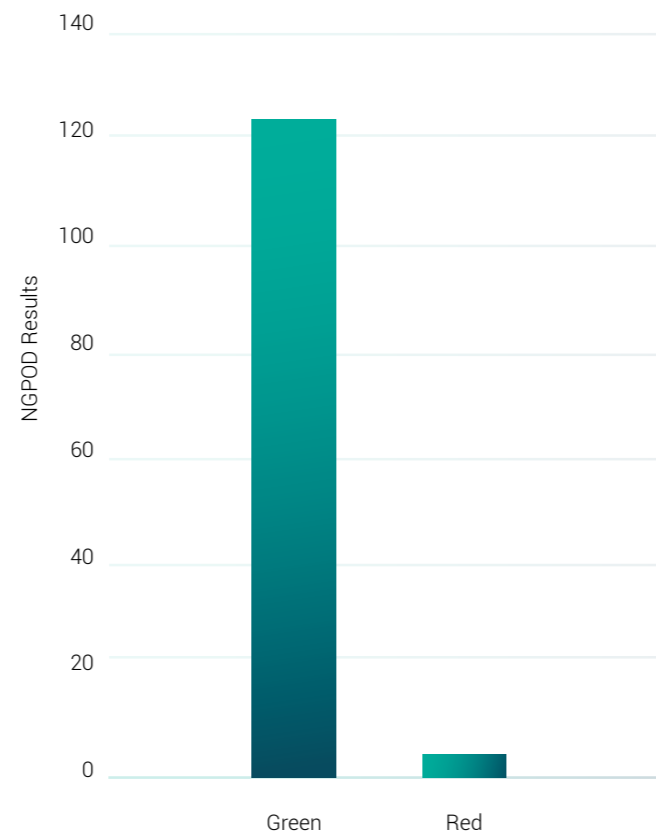


Figure 8: Graph showing the total number of aspirate and NGPOD tests undertaken during the evaluation period.

NGPOD

Of the total 113 NGPOD tests undertaken, 94% of them displayed a green result indicating correct placement of the NGT, resulting in only 7 indications of incorrect placement (red result). In the cases where both aspirate and NGPOD were used, 31 of the 35 tests gave a green NGPOD result meaning that it was unnecessary to also do the aspirate testing. For the remaining 4 tests a red result for NGPOD indicated incorrect placement. Conversely, in all 4 the pH of the aspirate test was shown to be below 5.5 indicating correct placement. Upon investigation it was found that in 2 of the cases, the NGPOD was not used repeatedly for the full 5 minutes as is recommended in the guidelines. The NGPOD was pressed once or twice in these incidents. In addition, the other red results found were also due to a change in the type of NGT being used. This led to the incorrect use of a sensor that was not the correct length or size for the NGT being used.

Aspirate testing

Of the 140 aspirate tests performed there were 11 instances where an aspirate test was not obtained (8%), this is a low number compared to the national average which can range from 15-40%). In 10 of these 11 instances an NGPOD was not carried out. In one instance where NGPOD was tried, despite not being able to obtain aspirate, a green NGPOD was observed resulting in no delay to feeding. In the other instances, there were delays in feeding, in many cases this was due to the nurses replacing the tube or repositioning the tube. For 5 of the patients an x-ray was needed to confirm placement leading to a mean delay of 8 hours to feeding.

Time of Use

For the evaluation, staff were also asked to record the time it took to perform pH testing with either aspirate or NGPOD. Only 15% of the total aspirate tests had times recorded and only 21% of the NGPOD tests were recorded. The results however show that the mean for the aspirate testing was higher 3.4minutes (SD 3.2min) compared to NGPOD 2.8minutes (SD 1.1min), although not significantly different. However, it was seen that whilst in some specific cases the aspirate testing could take a significantly longer time depending upon how hard it was to get the aspirate, the NGPOD timing was always quite consistent.

Staff Survey

Following completion of the service evaluation, staff were asked to complete a short questionnaire around their experiences of pH testing and NGT management. 8 responses were received from a range of nurse practitioners who work on Ward F. The results of the questions asked of the 8 people can be seen below. Results of the survey can be found in Appendix 2. The survey is split into 3 sections:

Personal Experience of pH testing

The first section focuses upon staff members previous experience with the standard aspirate type testing and their confidence with that technique. For the most part, 50% of the people surveyed said that they found aspirate testing easy to perform with 63% saying it was a quick and simple procedure. Only 25% of nurses said they found it a difficult procedure to perform and found it was not simple or quick. Interestingly, an overwhelming 87.5% did have confidence in the results they obtained and trusted the technique.

Personal Experience of the NGPOD training

The second section of the survey focused upon the training for the NGPOD device. 50% of the people surveyed said they found the NGPOD easy to use with 25% finding it difficult. Furthermore, 75% of people agreed that the training material supplied with the NGPOD was sufficient and the remaining 25% thought the material was ok.

Personal experience of using the NGPOD device

The final section of the survey aims to capture the nursing staff's experiences of using the NGPOD device. 37.5 % of nurses thought the device was easy to use, had confidence in the results obtained by the device and thought NG pod was an overall benefit to the patients. In contrast, 12.5% found it hard to use and did not have confidence in the technique. When asked about their views on whether they would recommend the device or whether they would like to use it instead of the standard aspirate testing the staff were split with 25% recommending it and saying they prefer to use it and 25% saying they preferred the aspirate testing. Throughout the survey many nursing staff (around 50%) did not seem to have strong views on either technique, preferring neither. What was almost universally agreed was that the NGPOD device was well tolerated by the patients (75%).



Staff Interviews

Following the survey, staff interviews were organised to gain a more in-depth understanding of NG tube management on the ward and the use of NGPOD. A total of 5 nurses from the ward were invited to perform a short interview to discuss their time using the NGPOD device during the evaluation and of pH testing in NGT management in general. A full list of the questions asked of staff is shown in Appendix 3. A summary of the responses to the interview questions is shown in appendix 4A. Overall, all of the staff interviewed were satisfied with the NGPOD device in general and identified that it is a good addition to NG tube management on the ward.

Nurse 1

'...it has prevented x-rays.'

Nurse 2

'So I think they are really good. It's certainly a lot less invasive it's definitely got some good advantages and I'd certainly want to use them.'

Nurse 4

'Yes, I definitely see its place on the Ward'

Despite this, the nurses interviewed did identify several issues and barriers to the implementation of the device particularly around the training provision and implementation of the technology. In addition, they experienced technical issues or had found some aspects of using the device difficult. The barriers and enablers identified by staff were related to the themes of Technology, Infrastructure and People and are summarised below.

Technology

One of the key areas explored with the staff using the device was the usability and effectiveness of the technology. Overall, the majority of staff interviewed were pleased with the technology, and found that it was relatively easy to use:

Nurse 1

'It just takes a little while to get used to using it.'

Nurse 2

'It's quite straightforward to use. you put the wire in and you attach to the machine and press the button. You can't go too wrong with it.'

Nurse 3

'I think once people have used a few times, they were quite confident in knowing how it works.'

Despite this, some technology related barriers were identified, such as:

- Staff experiencing technical issues, with using the device on some patients, i.e., the inability to pass the sensor down some of the NG tubes and the wrong length sensor being used on a number of patients give false 'red' reading with the device.
- User-friendliness of the NGPOD with some staff.
- Issues around the labelling of the sensors.

Nurse 1

'So, I think sometimes just we had a bit of a problem at the beginning about holding down the button too long to turn it on, you know, rather than it just needs a simple press.'

Nurse 5

'I think sometimes It was trickier to use than we thought it would be. Just needed a bit more force to get through or depending how the bridge have been attached if it had got the string through it as well. So, it was extra tight around the Ng tube. However, I think I've definitely used it where people had bridges, and so it does work.'

Nurse 4

'I don't think the sensors are labelled very well.'

Nurse 2

'There's a lot to steps to follow and sometimes it was hard to remember them.'

In addition, overall, the staff did not think that the NGPOD proved to be any quicker (or slower) than the current standard aspirate method and that in general both were about the same.

Nurse 1

'Both were about the same.'

Nurse 2

'I think they are about the same.'

Nurse 3

'I have had experiences where it's been quicker with the pod, but also I have had experiences where it's taken longer.'

Nurse 4

'I think people did find sometimes it took longer than expected, especially if they hadn't used it in a while.'

Enablers and suggestions for improvement were identified as follows:

- Development of a labelling system to ensure that the correct probes are used with the correct tubes so that false negatives are not shown.
- One nurse also suggested rather than a green or red-light result that an actual pH value could be displayed on the device. However, this was not shared by the other nurses and is in contradiction what has previously been reported about the development of pH testing devices.[14]

Nurse 2

'A colour code for the probes with a key on the boxes so it's easy to know which probe belongs to which tube.'

Nurse 5

'I would feel better if it said like 2.5 or something like that.'

Infrastructure

Another key area explored with the nurses interviewed was the infrastructure surrounding implementation of the device. The key barrier for

implementation of the device revolved around the training provision and education using the device. The primary barrier around using the device was around training. Key factors included:

- Staff would forget to use the device, or lose confidence in using the device if not used regularly.

Nurse 1

'The big problem is that sometimes people wouldn't use it for a long time, because we didn't have the patients on the ward. And would need a refresher.'

Nurse 4

'No, I think it's really easy to forget.'

Nurse 3

'I had the training but we're not on shift every day.'

Nurse 5

'There was a period of time in the ward where we didn't actually have many, patients with an Ng. So then when it came to actually using it, the training had been some time ago. So, I think we would just get anxious.'

'And if you don't use it for a week and then you're giving it again and you're going to try and remember what order I press the buttons in, you know, do I un attach? Reattach cap? And it was, yeah. So was that the IT was some of it was a bit tricky.'

Lack of general understanding of how the technology worked which would sometimes lead to misuse, such as:

Nurse 1

'Sometimes with the NGPOD It would initially flash red, and this would get people worrying about the technology, as nurses as we can often tell if the tube is in the right place, or the tube has been in the right place for a long time.'

Nurse 2

'Sometimes it would flash red for a while first and then it would eventually flash green. I think that's that was sometimes a concern of all. Why does it flash red 1st?'

Errors like this are down to gaps in the training and knowledge of how the device works. It is explained in the training materials that it can take up to 5 minutes of retesting (pressing the button on the

Pod every 30 seconds) for it to turn green. As it can sometimes take time for the sensor coating to be eroded by the acid environment in the stomach. This highlights a gap in staff training. In addition, the issue of not using a device for some time isn't just about NGPOD as this manifests in other technologies as well. E.g., a palliative care syringe driver may not be used for weeks but once they do need to use it, it can be difficult to remember the procedure. This just highlights the need for a training program to cover the length of time the device is being used in the clinical setting.

Enablers and suggestions for improvement were identified as follows:

- Implementation of competency-based training
- A detailed training program is required
- Dedicated refresher training to be implemented, regular training held on the ward
- A ward 'champion' for the device who can organise the training
- Posters and training material visible and readily available on the ward

Nurse 5

'Yeah maybe some sort of refresher training would have been useful....we need a lot more work done around training, so everyone knows how to use it.'

Nurse 4

'It would need a much more in-depth sort of training program built in around it if it's to be implemented.'

Nurse 3

'So, there's some time and to have the little poster to remind me this is what I do and that it I couldn't have done it without that.'

People

One of the key areas explored with the staff using the device was its effect on staff and patients. All staff interviewed were able to identify potentially beneficial effects of the service on patients. The following patient benefits were identified by staff:

- Reduction in x-rays

Despite this, some barriers were identified by the staff such as:

- The current culture
- Ingrained training and policies around using aspirate testing
- Increased anxiety around the risks of NGT management
- Resistance to change

Nurse 2

'It's a bit of a culture change (using it).'

Nurse 3

'There was definitely interest in the device although a bit of scepticism as well.'

'I think (there was a little resistance to it) I think people had a little bit more of a feeling of not trusting it as much.'

'I think it is that just because it's such a serious thing to get right that people just need to have complete trust in it.'

Nurse 4

'This is a sensitive topic and it's a whole new thing to learn which scares people. Everything comes back to the confidence. It's always confidence. That's what everyone is saying, (what's) my confidence in the technology.'

The nurses interviewed also expressed some concerns about completely changing over to NGPOD with the interviews suggesting that:

- Staff would prefer to see both tests being used alongside each other, with NGPOD as first line, and aspirate as a backup if the NGPOD cannot be used.

Nurse 1

'They should be used in conjunction with each other depending on the preference of the person.'

Nurse 2

'I am not sure I feel comfortable completely removing strips yet.'

Nurse 3

'My biggest concern would be if I kept getting a red, I would like the opportunity to try aspirate.'

Nurse 4

'I would still be wary about going for it 100%. I like them but I think for now we still have a place for aspirate testing.'

Nurse 5

'Going from pH strips being the gold standard to then changing to something else, ...people found it quite difficult to do because of how much trust they had in the pH strips.'

Enablers and suggestions for improvement were identified as follows:

- Communication with staff about the new device.
- More education with the staff about the device.
- More top-down control and guidance to provide confidence around using the device.
- Increased efforts to ensure the technology is available to more people.
- Integration and training to be implemented at an early stage so that newly qualified nurses are experienced with the technology.

Nurse 1

'I think if you're going to implement this type of technology in this area. (It's implementation) needs to be from a higher level (upper management). So, that's its coming from both sides, the shop floor and management. Both sides must be feeling the same. So, everyone saying the technology is good, but there's just the bits around it need to be sorted for it to be useful in the real world.'

Nurse 2

'it just needs to be around in people's hands more and in people's faces more often and eventually it will become more accepted into practice.'

Nurse 3

'I think if you had newly qualified nurses who were only taught to use the NGPOD and didn't know about pH strips or pH strips were just a backup, that it would easily be common practice. They wouldn't know any different. So, it's a big thing that common practice element. This is a little bit difficult (barrier) to get over with the new technology essentially.'

Nurse 4

'If new nurses came in only using the pod, I'm sure they would, find it a lot easier to accept it.'

Furthermore, the nurses identified that there was interest from outside the ward in the technology.

Nurse 2

'We had nurses coming from other wards where we were using the Ng pod. They're were really interested in it. You know, if we had agency nurses, they were all trained with NGPOD that would be great. They would all be saying 'What's that? What's that?' they wanted to learn how to use it and yeah, so that was nice and shows there is potential for change.'



Ward F, Morrision Hospital, Swansea Bay UHB

Key Findings & Impact

Technology

The majority of staff surveyed and interviewed indicated that the NGPOD was simple and easy to use and had the potential to reduce the need for x-rays.

Over the evaluation period a total of 259 pH tests were carried out. Despite the evaluation protocol dictating that NGPOD should be used as the first line for all pH testing, 140 of them were still carried out using aspirate testing and NGPOD was not undertaken. The reasons identified were agency staff not trained to use the NGPOD or staff being uncertain or having anxiety in using the device. From the staff interviews much of this anxiety seems to be drawn from inactivity in using the device and the lack of available refresher training on the ward. This was particularly the case early in the evaluation for the first 10 patients.

In the 140 aspirate tests there were 11 (8%) instances where an aspirate was not obtained. 10 of these an NGPOD was not attempted in 1 NGPOD was used, and a green result was obtained, showing that NGPOD did eliminate any delays in feeding for one of the patients. Of the 113 NGPOD results obtained 94% showed a green result, with the red results all being caused by improper use of the device. The results for the speed of the test shows no significant difference between how long it takes to perform an NGPOD vs an Aspirate test. This is corroborated by the results from the survey and interviews where staff observed it took about the same time.

In addition, one patient required 24 pH tests, but these could only be undertaken using the aspirate method. The reason for this was due to the patient in question having a bridle attached, the loop in the bridle proved very difficult to navigate and the sensor could not be passed down the NGT and being stuck, before being removed, meaning it could not quite fit the whole way down the tube. A similar occurrence also happened in two other patients with bridles. However, upon repositioning the NGT the issue

seemed to resolve in one patient and the second patient had to have their NGT replaced (for other clinical reasons) and the second NGT did not have the same issues. In addition, it was found that in certain cases the wrong length probe was used (too short) for a particular brand of NG tubes. This resulted in an incorrect 'red' result on the NGPOD that was due to an incorrect use of the technology. Both these issues highlight a need for further training and understanding around the principles of the technology and for additional training if/when bridles are used.

Infrastructure

The key finding from this evaluation highlighted that the current training around the device is insufficient. In particular, there was a lack of knowledge around how the device worked which could lead to its incorrect use. This often manifested as not using the NGPOD for long enough. However, only 7 'red' results were recorded using the NGPOD device over the course of the evaluation (compared to 106 green) indicating that this problem was generally quite rare.

In addition, there were some cases where both NGPOD and aspirate testing were done in conjunction with each other. The use of both devices also shows a lack of understanding about NGPODs addition within the services as it is to be used as a replacement for aspirate testing. This misunderstanding created extra work and more uncertainty around using NGPOD on the ward, with nurses being quoted 'it takes longer as I have to use both'. Despite several meetings and discussions with the staff that this was not the case, the continued use of both in isolated cases was still seen towards the end of the evaluation. Potential reasons for this and through discussion with the nurses identified that some staff were anxious and uncertain in using the device, with some nurses feeling they lacked sufficient training. In addition, it was identified that many nurses didn't quite understand the underlying principles of the device. This identifies a significant barrier in implementation of the device and implies a greater focus is required around training and confidence in the device.

Another key finding was for additional provision allowed for training and the need for a persistent training program. One of the key issues is that the aspirate testing was still used far more regularly than the NGPOD during the evaluation. The NGPOD should have been first choice in those staff who were trained. The use of untrained agency staff cannot account for all of the missed NGPOD tests. The main cause seems to stem from uncertainty and anxiety around the device, particularly if not used by a practitioner for an extended period of time.

This highlights a requirement for continuous refresher training within the department, more communication throughout the department about using the NGPOD and the need for a responsible person within the Ward (or health board) who takes leadership and ownership of training and can be a point of contact.

People

The staff interviews and survey indicated that, within the current climate and standard care, aspirate testing was trusted and well liked. Staff indicated that it would be difficult to fully implement just NGPOD on a ward as people are very comfortable with the old testing regime. They indicated that any change would take time and that for successful integration of the technology, a greater understanding of the benefits of the technology was needed as well as a deeper understanding of how it works.

The staff indicated that to build confidence in the device, more reassurance and support is needed by ward upper management and the health board in general.

Staff also commented that for successful integration of the technology onto the ward, pre-registration nurses in training should become exposed to the device as early as possible, so that using the device rather than aspirate becomes part of their normal routine clinical practice.

Conclusion

NGPOD was found to be effective when using the device for the intended purpose and using it as per the manufacturer's specified conditions and instructions for use. It is just as quick as aspirate testing and reduces the need for x-rays in a real-world setting. The evaluation indicated that despite the effectiveness of the technology more structure was needed around the implementation of the device, education of its use/mode of operation and the development of a competency-based training program within the health board. Due to some of the issues around correct implementation of the evaluation additional work may be needed regarding cost effectiveness and impact upon staff time.



FINDINGS

Hywel Dda University Health Board
Gwenllian Ward
Real World Evaluation

Period: 21/03/2022 to 07/09/2022

Gwenllian Ward, Glangwili – Hywel Dda UHB

Overview of the Stroke Service

Service Overview

The stroke service at Glangwili Hospital, Hywel Dda UHB sees around 400 acute stroke patients who present to the hospital each year admitted and treated on the 16 bed stroke ward.

As part of their service, the stroke ward nursing team are responsible for managing and delivering their NG tube feeding procedures on the Ward. The team is supported by a specialist Lead CNS Nutrition Nurse from the Dietetic department. Gwenllian Ward sees between 10-30 patients who require feeding and medication to be delivered via an NG tube a year.

NG Tube Management Service Objectives

The NG tube management at Hywel Dda UHB is dictated by Enteral feeding policy and Operational Guidelines. More information can be found [here](#).

Fine Bore Nasogastric Feeding Tube Placement

These guidelines are ONLY for Health Care Professionals who have received HDDUHB nasogastric tube insertion training

Hywel Dda University Health Board
Decision Tree for Nasogastric tube placement in adults

Direction for insertion

- Remove tube and stylet from package. Close access port. Seat stylet connector firmly into tube connector, make sure stylet connector stays firmly seated during intubation.
- Measure length of tube to be inserted to assure that tip enters gastric region (NEX measurement).
WARNING: Pre-measurement of tubing length is essential.
- Activate lubricant on tip of tube by dipping end in tap water. If more than several minutes elapse before tube insertion is attempted, additional dipping of tip may be required.
- Confirmation of tube position can be done with or without stylet in place. Confirm gastric position by aspiration of gastric contents using a 60ml purple enteral feeding syringe. If it is difficult to obtain a gastric aspirate see solutions to common problems.
WARNING: Confirmation by x-ray may be indicated in high risk patients.
- The internal lubricant of the tube must be activated immediately before the stylet is removed. Open side arm access port (if closed) and flush tube with 10ml of water. Remove stylet immediately.
WARNING: Tube position must be confirmed prior to flushing tube with water.

Solutions to common problems

- Air but no aspirate..** Try inserting tube slightly further and then aspirating
- Cannot obtain air or aspirate..** Try pulling the tube back slightly and then aspirating
- Tube occluded on mucosa..** Inject 10mls of air down the tube then try aspirating
- Not much fluid in stomach..** Try placing the patient in LEFT lateral position to ensure the tube falls towards any stomach contents

Sticker located in tube packaging

Don't Forget the sticker!

- Place the sticker that is in the tube packaging in the patients' medical notes and complete ALL sections.
- If CXR is required, document in the medical notes:
 - Date x-ray reviewed
 - Time x-ray reviewed
 - X-ray number (sticker will be placed on end of the NG tube in the x-ray dept)
 - Position at where the tube can be seen
 - Who reviewed the x-ray (Dr's name and bleep number)

For further information please see:

- HDDUHB Enteral Feeding Policy and Operational Guidelines
- The NPSA 2011 Alert
- HDDUHB intranet Nutrition web page 46504

Reference:
CORPAK Corflo NG feeding tube placement.

For further support please contact the CNS Nutrition team

Figure 9: NG tube directions for use at Hywel Dda UHB.

How will NGPOD be introduced to the service?

For the evaluation it was stipulated that using the NGPOD will not change any of the SOP's or the policy documents outlined by the health board. The only difference will be that NGPOD was intended to be used to measure pH when testing the correct placement of NGT. During this service evaluation, the evaluation plan indicates that initial placement of the NG tube will still use the aspirate and pH strip tests for determining pH. The NGPOD device is only to be used for all subsequent pH test. The aim of the evaluation detailed in this report is to assess the impact of the NGPOD device in terms of its implementation, useability and acceptability. Only trained persons, who are proficient in the use of the NGPOD will use the NGPOD device (people not trained will continue to use the aspirate testing). The choice of pH testing will be ultimately left to the clinical teams decision.

Training of NGPOD

Initial NGPOD training was delivered by an approved NGPOD Global trainer, to the ward staff on 01/03/2022. The nurse ward managers and senior nursing staff were trained with the device, with the ability to train others. Additional training and oversight of staff on the Ward management of NG tubes was performed and overseen by a Lead CNS Nutrition Nurse from the Dietetic department, with extra training by NGPOD Global staff made available if required.

Findings

The evaluation was originally planned to run over 3 months starting on the 21/03/2022, however the project recruitment was extended by 2 months and finished on the 14/08/2022 due to poor patient recruitment. Information for NGT patients who were involved in the study before the 07/09/2022 was collected until no more NGT data was available for that patient.

During this period, a total of 8 patients were seen on Gwenllian Ward at Glangwili Hospital needing an NGT. For this evaluation all data around NGT feeding and management was collected for each patient.

Demographics & Recruitment

Demographics of the NG patients on Gwenllian are shown in table 2 below.

Parameters	Value
Age (years)	79.2±8.7
Gender Male (n, %)	62.5%

Table 2. Demographics of NGT patients on Gwenllian Ward (n = 8).

Patient Recruitment

Recruitment of the patients was sporadic throughout the duration of the evaluation, with large periods of time where no patients were recruited.

pH testing

A total of 57 pH tests recorded over the course of this evaluation. 15 of these were due to initial placements of the NG tubes. For these tests only aspirate was used. Of the remaining 42 tests, which were undertaken for follow up testing or fit to feed testing, 30 were undertaken using an NGPOD and 12 were undertaken using aspirate testing.

Of all the 27 aspirate tests undertaken, 5 resulted in a pH above 5.5, all of these were recorded on initial placement and so the patient was sent for an x-ray. As it was outside the scope of the protocol for this evaluation, NGPOD was not undertaken on these patients. 12 tests using the aspirate method for pH determination were undertaken for follow up testing and not initial placement. For these 12 tests NGPOD should have been used instead of aspirate testing as per the protocol for the evaluation. It was identified that some staff were uncertain about using the device, This was primarily due to a lack of training or they just did not want to use it and preferred to use the aspirate method.

Of the 30 NGPOD results carried out, 5 were observed to be red (16.7%). On all 5 an aspirate test was undertaken as a second line choice test and in all cases the aspirate testing showed the pH was below 5.5 and the tube was in the correct position. No mitigation or reasons were provided for why the red was viewed on the NGPOD device when the tube was in the correct place.

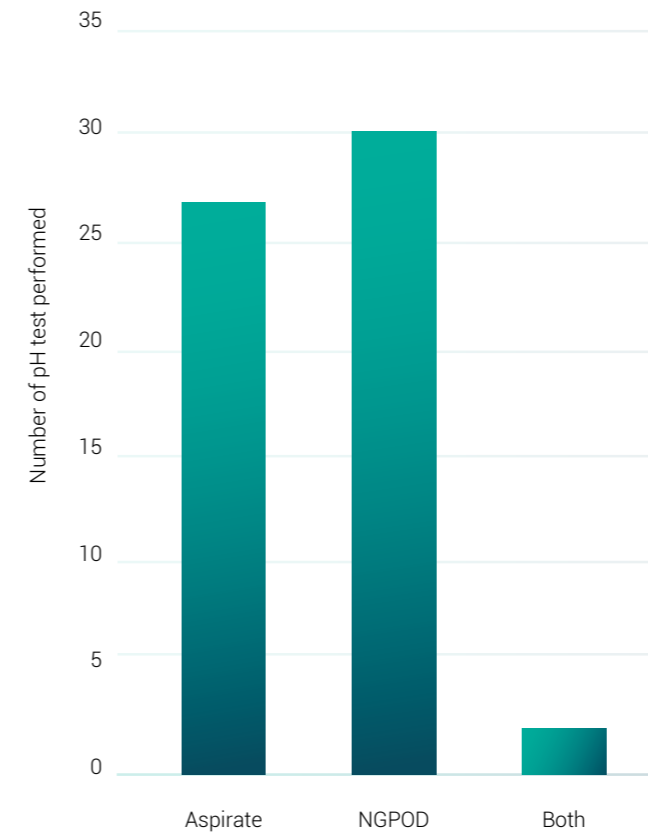


Figure 10: Graph showing the total number of aspirate and NGPOD tests undertaken during the evaluation period.

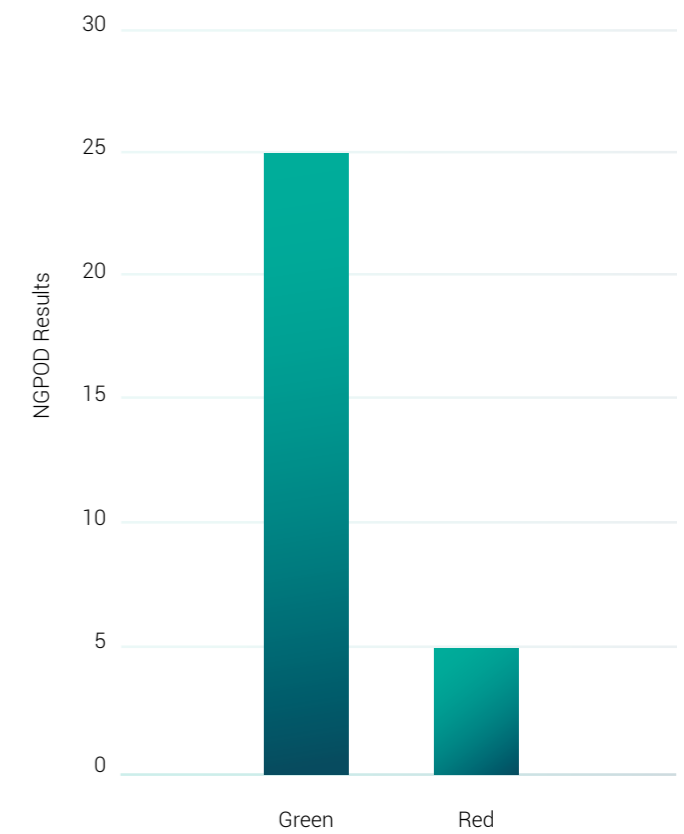


Figure 11: Graph showing the total number of aspirate and NGPOD tests undertaken during the evaluation period.

Staff Interviews

Following the survey, staff interviews were organised to gain a more in-depth understanding of NG tube management on the ward and the use of NGPOD. A full list of the questions asked of staff is shown in appendix 3. A summary of the responses to the interview questions is shown in appendix 4A by the lead Dietetic Nurse. Overall, the staff members saw a place for the NGPOD in the management of NG tubes, particularly in the hands of a trained specialist.

'I can see a place for it, I see it as rather than a replacement in all patients, I see it as a really simple device to use by a specialist, someone who is used to NG and pH testing.'

And identified its place in specialised situation.

I see a place for it in the community setting where it could reduce the amount of hospital admissions.'

Despite this the nurse had strong views that the device should not be used in general wards where staff are not routinely exposed to pH testing.

'I wonder if it's not necessarily for the masses, when it's being used by someone who isn't confident or experienced with all of NG management including pH testing we are giving them another technique to use that they don't feel confident with.'

The person interviewed did identify several issues and barriers to the implementation of the device particularly around the training provision and implementation of the technology. In addition, they experienced technical issues or had found some aspects of using the device difficult. The barriers and enablers identified by staff were related to the themes of Technology, Infrastructure and People are summarised below.

Technology

One of the key areas explored with the staff using the device was the usability and effectiveness of the technology. Overall, the majority of staff interviewed were pleased with the technology, and found that it was relevantly easy to use:

'If it's used in the right way it's very simple.'

'It was very quick to use if you know what your doing.'

'Using the NGPOD just requires a mindset change.'

Despite this, some technology-related barriers were identified, such as:

- Staff experiencing technical issues, with using the device on some patients, i.e. the inability to pass the sensor down some of the NG tubes.
- Issues around the labelling of the sensors.

'In the beginning I found (the fact that the NGPOD gives a definitive green or red result with no interpretation) quite challenging.'

'I think at first what did frighten me a little bit at the beginning if you get a couple of red results in a row before a green. Where I think this is a little bit of user error, where you're pressing the button too quickly and not waiting for a sufficient time for the acid in the stomach to (effect) the reagent on the probe.'

'So even when you get a green you're always thinking yes but I got a few reds, is it safe to feed? Again, it requires that bit of knowledge of how it works.'

AND

'Couple of occasions where it wasn't possible to place a sensor down the NG tube, it happened with a couple of patients but there was one in particular in which we really struggled. It didn't matter how hard to tried I just couldn't get the probe down.'

'A couple of nurse also mentioned that it was abit of a hassle that to make the probe fit you had to take the grip lock off the cheek sometimes.'

Enablers and Suggestions for Improvement were identified as follows:

- Development of a labelling system to ensure that the correct probes are used with the correct tubes so that false negatives are not shown.

'From a safety point of view this was an issue for me, once you have opened a box the packaging on the individual sensors doesn't really tell you what is the cm marking on the sensor or which tube it is used for, which is a safety issue for me. I think not having the sensor marked on the sensor is an issue. We got around it my writing on each sensor pack what tube it goes with.'

'If the sponsors don't have the wording its hard to tell. There needs to either be a marking on the sensor or a colour code system so its easy to pair the tube with the sensor.'

The nurse did give one very positive example of using the NGPOD:

'We had one patient who we were using Aspirate testing on initial placement as per our guidelines, but the pH was showing up as a 6, she had x-rays but due to her size it was not clear whether the tube was in the correct place, which was only confirmed by a Radiologist, where it was almost impossible to see the NG. Interestingly they were using the NGPOD on her and it was showing as green.'

Infrastructure

Another key area explored with the nurse interviewed was the infrastructure surrounding implementation of the device. The key barrier for implementation of the device revolved around the training provision and education using the device. The primary barrier around using the device was around training. Key factors included:

- Staff would often lose confidence with the device if they didn't use it regularly.

'One of the bigger issues is when people who haven't used it in a while go to pick it back up and need a refresher they don't know who to go to, and the person they do go to also hasn't used it in a while. Which might not be due to the device itself but due to it being a new device.'

Despite this the nurse did identify that in their opinion the training provided was sufficient and that it should not take a lot to keep peoples skills up to date.

'I think the training and the device is very simple to use.'

'I don't think it would take much to keep people's skills up.'

'It (the training) needs oversight from a specialist.'

'There needs to be a more phased approach to training rather than just one training day at the beginning.'

Enablers and suggestions for improvement were identified as follows:

- Implementation of competency-based training.
- A detailed training program is required.
- Dedicated refresher training to be implemented, regular training held on the ward.
- A ward 'champion' for the device who can organise the training.

'There needs to be someone (NGPOD champion) in a health board or trust that uses it in the right way and right places.'

'(for this to work) This has to be supported by the health board.'

'It needs to be competency based training, competency based training on new devices always works better.'

People

One of the key areas explored with the staff member was using the device. All staff interviewed were able to identify potentially beneficial effects of the service on patients.

Despite this, some barriers were identified, and this again revolved around training

Enablers and suggestions for improvement were identified as follows:

- Communication with staff about the new device.
- More education with the staff about the device.
- Training should involve observation of actual use on patients to build confidence.

'Knowledge and training is how we keep people safe, not necessarily devices, it's the knowledge and training you give your staff. So if you have someone driving that in a health board that will make a difference.'

'If we did take on NGPOD we would need to make sure when people did their NG tube insertion training that they also did NGPOD training and have people be observed using the device.'

'There needs to be an element of observational based training on actual patients. What you learn in a one off teaching session is usually not going to be enough. Troubleshooting with the trainee will always provide people with better competency and confidence.'



Gwenllian Ward, Glangwili – Hywel Dda UHB

Key Findings & Impact

Technology

The nurse interviewed identified that the device was easy to use and that it was easy to be trained and shown how to use the device.

Over the evaluation period a total of 57 pH tests were carried out. Despite the evaluation protocol dictating that NGPOD should be used as the first line for all pH testing, 12 of them were still carried out using aspirate testing despite the fact that NGPOD should have been used instead, NGPOD was not undertaken. The reasons identified were agency staff not trained to use the NGPOD or staff being uncertain or having anxiety in using the device. From the staff interviews much of this anxiety seems to be drawn from inactivity in using the device and the lack of available refresher training on the ward.

In the 30 NGPOD tests performed a high percentage (16.7%) were a red result indicating incorrect placement of the tube, despite that fact that when they were tested with aspirate they were confirmed to be in the correct place. No explanation could be found for this discrepancy.

There were some technical issues observed over the duration of the evaluation. It was found that in some patients it could be difficult to pass the NGPOD probes through the NG tube.

Infrastructure

The key finding from this evaluation highlighted that the current training around the device is insufficient. The main issue revolved around people being able to maintain their skills whilst using the NGPOD, particularly if there are not many pH test procedures to perform or not many patients requiring NG tubes.

A key finding was that there needs to be a greater emphasis on the provision of training and the need for a more general and persistent training program. This highlights a requirement for a continuous refresher training program within the department, and the identification of a ward or Health board NGPOD champion. A person who can act as a dedicated trainer or point of contact when using the device.

People

The staff indicated that to build confidence in the device more reassurance and support is needed by ward upper management and the health board in general.



References & Appendices

References & Appendices

References

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Appendix 1 – Service Provider User Feedback Survey

NGPOD Service Evaluation Survey Questions User Experience and Feedback

Read each statement carefully then indicate whether you agree with the statement.

'All responses will be anonymous'

Personal Experience of pH testing

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The pH testing method using aspirate and pH strips is easy to use					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The pH testing method using aspirate and pH strips is quick and simple					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I have confidence in the results obtained from aspirate and pH strips, particularly when it comes to feeding the patient					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

Personal Experience of the NGPOD training

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I found it easy to learn how to use the NGPOD					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The training material for using the NGPOD was sufficient					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

Personal experience of using the NGPOD device

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The NGPOD device is easy to use					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The pH testing method using the NGPOD device is quick and simple					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I have confidence in the results obtained when using the NGPOD device, particularly when it comes to feeding the patient					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I would recommend the NGPOD device to other care providers					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I would prefer to use the NGPOD device for measuring pH over the aspirate method					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
The pH testing procedure with NGPOD was well tolerated by the patient(s) I used it on					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I think using the NGPOD device is an overall benefit to the patient					
If you have anything else, you would like to add please do so here: (Please do not include any identifiable information within your response)					

Appendix 2 – Service Provider User Feedback Survey

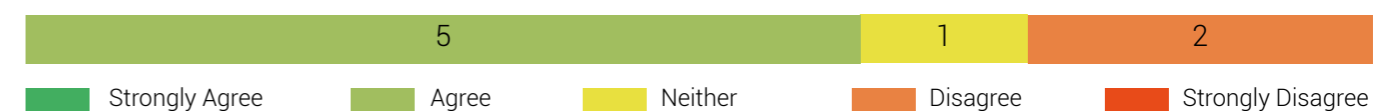
8 Responses from staff at Ward F, Morryston Hospital, Swansea Bay UHB

Personal Experience of pH testing

Q1: The pH testing method using aspirate and pH strips is easy to perform



Q2: The pH testing method using aspirate and pH strips is quick and simple



Q3: I have confidence in the results obtained from aspirate and pH strips, particularly when it comes to feeding the patient



Personal Experience of the NGPOD training

Q4: I found it easy to learn how to use the NGPOD

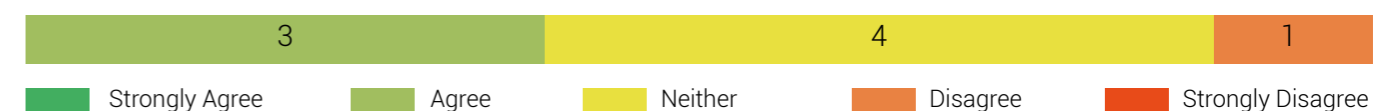


Q5: The training material for using the NGPOD was sufficient



Personal experience of using the NGPOD device

Q6: The NGPOD device is easy to use



Q7: I have confidence in the results obtained when using the NGPOD device, particularly when it comes to feeding the patient



Q8: I would recommend the NGPOD device to other care providers



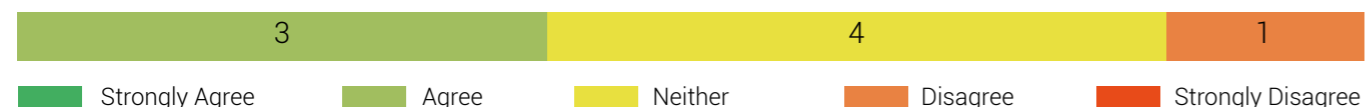
Q9: I would prefer to use the NGPOD device for measuring pH over the aspirate method



Q10: The pH testing procedure with NGPOD was well tolerated by the patient(s)



Q11: Do you think using the NGPOD device is an overall benefit to the patient



Appendix 3 – Service Provider User Feedback Interview Schedule

Interview Schedule

Q1: Do you see a place for NGPOD? In on your ward or in healthcare in general.

Q1b: What is your experience of using aspirate testing?

Q2: Have there been any difficulties in using the NGPOD device?

Q3: should NGPOD replace pH testing strips?

Q4: Do you think that there needs to be more oversight or training involved with regards to NGPOD?

Q5: Do you find the NGPOD easy to use? and to remember how to use when you can say you haven't used it for a while?

Q6: In general, did you find using the NGPOD was quick? Was it quicker or slower process than aspirate and pH strips?

Q7: Did you have any comments on the actually NGPOD design?

Q8: do you have any examples of using the NGPOD you would like to share?

Appendix 4A – Service Provider User Feedback Interview Answers from Ward F, Morriston Hospital, Swansea Bay University Health Board.

Below are the cumulative answers for each question from 5 different Nurses who work at Ward F, Morriston Hospital.

Q1: Do you see a place for NGPOD? In on your ward or in healthcare in general.

Nurse 1

'Yeah, instead of pH strips, it has been useful at times when we haven't been able to get aspirate and it has prevented x-rays.'

Nurse 2

'Yes, I definitely see its place on the Ward.'

'It's a bit of a culture change (using it) it just needs to be around in people's hands more and in people's faces more often and eventually it will become more accepted into practice.'

'I think if you had newly qualified nurses who were only taught to use the NGPOD and didn't know about pH strips or pH strips were just a backup, that it would easily be common practice. They wouldn't know any different. So, it's a big thing that common practice element. This is a little bit difficult (barrier) to get over with the new technology essentially.'

Nurse 3

'There was definitely interest in the device although a bit of scepticism as well.'

'I prefer to use NGPOD instead of sending them for an X-ray.'

'I think if you're going to implement this type of technology in this area. (It's implementation) needs to be from a higher level (upper management). So, I think that's what's coming through on both sides, the shop floor and management. Both sides must be feeling the same. So, everyone saying the technology is good, but there's just the bits around it need to be sorted for it to be useful in the real world.'

Nurse 4

'Everything comes back to the confidence. It's always confidence. That's what everyone is saying, (what's) my confidence in the technology.'

'I would still be wary about going for it 100%. I like them but I think for now we still have a place for aspirate testing.'

Nurse 5

'I think for it to be of benefit on the ward, you want a machine that you can hand to the next person on duty and say Use that. This means we need a lot more work done around training, so everyone knows how to use it.'

'I think it will be personal preference of the nurse because at the end of the day the nurse is responsible for that patient, and they got to be happy and feel confident in what they are using.'

Q1b: What is your experience of using aspirate testing?

Nurse 1

'I think because we see it quite often, it's just something we don't really know any different, we just do it. We just don't even think back, don't think anything. And obviously as times gone on, we learn different tricks to obtain an aspect like turning patient on their side. So generally, I find it easy to do.'

Nurse 2

'Sometimes, yeah, like all night. If I've had a patient where I can't get aspirate, leave to go for an X-ray like late in the night. It is a bit annoying, but it's not all the time.'

'I would say you probably get an aspirate about 7 out of 10, times. then sometimes we must like turn them on their side or something and then we'll get one after that.'

Nurse 3

'Aspirate is usually quite quick to get normally, takes about 5 minutes.'

Nurse 4

'People are different, some patients, you get quite a bit of aspirate, others you just about managed to get one or two drops in the tube, which means you then got to pull the tube apart and put you strip on like those drops.'

Nurse 5

'Yeah, I think cause, you know, we are used to using the pH strip.'

'Personally, I like seeing the aspirate.'

Q2: Have there been any difficulties in using the NGPOD device?

Nurse 1

'You know, sometimes with the NGPOD It would initially flash red, and this would get people worrying about the technology, as nurses as we can often tell if the tube is in the right place, or the tube has been in the right place for a long time.'

Nurse 2

'Sometimes it would flash red for a while first and then it would eventually flash green. I think that's that was sometimes a concern of all. Why does it flash red 1st?'

Nurse 3

'I think (there was a little resistance to it) I think people had a little bit more of a feeling of not trusting it as much. It's probably a bit of change, isn't it? If you had... if new nurses came in only using the pod, I'm sure they would, find it a lot easier to accept it.'

Nurse 4

'This is a sensitive topic and it's a whole new thing to learn which scares people.'

Nurse 5

'On one or two patients where it (the probe) wouldn't pass at all. I think sometimes It was trickier to use than we thought it would be. Just needed a bit more force to get through or depending how the bridle have been attached if it had got the string through it as well. So, it was extra tight around the Ng tube. However, I think I've definitely used it where people had bridles, and so it does work.'

Q3: Should NGPOD replace pH testing strips?

Nurse 1

'They should be used in conjunction with each other depending on the preference of the person.'

Nurse 2

'I am not sure I feel comfortable completely removing strips yet.'

Nurse 3

'My biggest concern would be if I kept getting a red, I would like the opportunity to try aspirate.'

Nurse 4

'I think this would be really hard. From my experience and the other experiences are the nurses on the ward, I think because it's always been drilled into us to use to pH strips and to check it thoroughly before using the NGS.'

Nurse 5

'Coming from that (pH strips) being the gold standard to then changing to something else, and I think people found it quite difficult to do because of how much trust they had in the pH strips.'

Q4: Do you think that there needs to be more oversight or training involved with regards to NGPOD?

Nurse 1

'The big problem is that sometimes people wouldn't use it for a long time, because we didn't have the patients on the ward. So, I think we need some form of refresher training.'

Nurse 2

'There's a lot to steps to follow and sometimes it was hard to remember them.'

Nurse 3

'Yes, I think it is that just because it's such a serious thing to get right that people just need to have complete trust in it.'

Nurse 4

'It would need a much more in-depth sort of training program built in around it if it's to be implemented.'

Nurse 5

'Yeah maybe some sort of refresher training would have been usueful.'

Q5: Do you find the NGPOD easy to use? and to remember how to use when you can say you haven't used it for a while?

Nurse 1

'Yeah, it just takes a little while to get used to using it. This is what a couple of other nurses also told me.'

Nurse 2

'I mean I know it's quite straightforward to use. you put the wire in and you attach to the machine and press the button. You can't go too wrong with it.'

Nurse 3

'I think once people have used a few times, I think there were quite Confident in knowing how it works and you know how to turn on how to attach all the components.'

Nurse 4

'No, I think it's really easy to forget. And because we're so used to just get you, you know, using the aspirate strips, the pH strips, I think it's just, you know.'

'I had the training but we're not on shift every day. And when we are on shift, not every you know, we may not even be looking after patient with an NG. So, there's some time and to have the little poster to remind me this is what I do and that it I couldn't have done it without that.'

Nurse 5

'I think that's how I felt with the Ng pod training. I think when I had it there was it was a period of time in the ward where we didn't actually have many, if any, patients with an Ng. So then when it came to actually using it, the training had been, some time ago. So, I think we would just get anxious.'

'And if you don't use it for a week and then you're giving it again and you're going to try and remember what order I press the buttons in, you know, do I un attach? reattach cap? and it was, yeah. So was that the IT was some of it was a bit tricky.'

Q6: In general, did you find using the NGPOD was quick? Was it quicker or slower process than aspirate and pH strips?

Nurse 1

'Both were about the same.'

Nurse 2

'I think they are about the same.'

Nurse 3

'I have had experiences where it's been quicker with the pod, but also I have had experiences where it's taken longer than aspirate.'

Nurse 4

'I think people did find sometimes it took longer than expected, especially if they hadn't used it in a while.'

Nurse 5

'But everybody's looking for is a a quick fix, really, isn't it? And something faster than and they. And because when it was first explained and 1st shown, that's what we all thought. We all thought all good. This is going to be so much easier, isn't it? But we didn't sort of account for a couple of the issues we ran into.'

Q7: Did you have any comments on the actually NGPOD design?

Nurse 1

'So, I think sometimes just we had a bit of a problem at the beginning about holding down the button too long to turn it on, you know, rather than it just needs a simple press. But again, that was kind of rectified fairly quickly with just some simple teaching.'

'I was surprised by how many probes we seemed to go through.'

Nurse 2

'We had nurses coming from other wards where we were using the Ng pod. They're there really interested in it. You know, if we had agency nurses, they were all trained with NGPOD that would be great. They would all be saying 'What's that? What's that?' they wanted to learn how to use it and yeah, so that was nice and shows there is potential for change.'

'They should investigate develop for the technology is like colour code for the probes with a key on the boxes so it's easy to know which probe belongs to which tube.'

Nurse 3

'I think one of the things I have noticed with it. Especially when you are using that, and you see you get a red. You sometimes think I didn't get a result and forget you have to keep trying for up to five minutes.'

'I think there's also the issue with that is that the timing, because if it's too close you, if you're putting a probe down too close to when you finish the feed, say the feed finishes at 4:30 and then at 5:00 o'clock you're coming to do meds. So, you're having to recheck because you're using the tube again and that sometimes you can get the feed rather than anything else.'

Nurse 4

'I don't think the sensors are labelled very well.'

Nurse 5

'Yeah, and I just think, you know, we don't really like change doing it just means every time the pH on it like on the machine, I would feel better if it said like 2.5 or something like that. Yeah. Then I would feel better.'

Q8: Do you have any examples of using the NGPOD you would like to share?

Nurse 1

'He's (a patient) had it (NGT) in for ages and I knew that it was probably in the right place. It hadn't moved. I tried for about 15 minutes with the NG pod and it kept saying red. I thought I'll just try a bit of aspirate for a pH strip and I drew up so much aspirate in the syringe and it you know the pH was absolutely fine and it was that was frustrating as to why that didn't work. It was shortly after this we had found out the sensors we had were not the correct ones for the NGT as we had changed the tube but not got new sensors for it.'

Nurse 2

'So I think they really good. They still think they were they certainly a lot less invasive and they you know especially if they do work you know with going out of ours and that they're they're definitely better than an X-ray they definitely better than you know if you can't get a Ph can't get enough asp spirit you're moving the patient from left to right you know you know it's definitely good advantages and I'd certainly want to use them.'

Nurse 3

'I had one where it was like it was red and then it went green And then when I did it again, it was red again. So I was just like, I don't know, I just didn't trust it. Follow up question: did you change the probe? Yes.'

Nurse 5

'I can remember putting one in. I couldn't get it was red, red, red all the time. I then got an aspirate. No problem. I then put the probe back down and it went green. That's probably because there was some aspirate in the tube at that point.'

Appendix 4B – Service Provider User Feedback Interview Answers from Gwenalin Ward, Glangwili Hospital, Hywel Dda University Health Board.

Below are the cumulative answers from the lead Dietetic Nurse at Glangwili Hospital, Hwel Dda UHB

Q1: Do you see a place for NGPOD? In on your ward or in healthcare in general.

'I think I can see a place for it, perhaps alongside the other methods we have national for pH testing.'

'I see it as rather than a replacement in all patients, I see it as a really simple device to use by a specialist, someone who is very used to NG and pH testing.'

'I see a place for it in the community setting where lit could reduce the amount of hospital admissions.'

'I can see a place for it.'

'I wonder if it's not necessarily for the masses, the NGPOD needs to be used correctly.'

'If it's used in the right way it's very simple.'

'When it's being used by someone who isn't confident or experienced with all of NG management including pH testing we are giving them another technique to use that they don't feel confident with.'

'Perhaps people don't feel confident in NG tube care because they do enough NG tube care.'

'One of the big advantages of this device is that its not very big so its easy to move around and to us it out in places like the community.'

Q1b: What is your experience of using aspirate testing?

'Ph testing is something we've always done, if you spoke and asked an individual nurse how safe pH testing (using aspirate) they would probably say 'oh its very safe', because it's what we have always done. But I (we) know there are limits, there are times especially during Covid, where pH (aspirate testing) was not very reliable which made things very difficult.'

Q2: Have there been any difficulties in using the NGPOD device?

'In the beginning I found (the fact that the NGPOD gives a definitive green or red result with no interpretation) quite challenging, its like a traffic light, its green so its good to go then?'

'I think at first what did frighten me a little bit at the beginning if you get a couple of red results in a row before a green. Where I think this is a little bit of user error, where you're pressing the button too quickly and not waiting for a sufficient time for the acid in the stomach to (effect) the reagent on the probe.'

'So even when you get a green you're always thinking yes but I got a few reds, is it safe to feed? Again, it requires that bit of knowledge of how it works.'

'Using the NGPOD just requires a mindset change, I mean we've had a similar issue across Wales as we have changed our pH strips, which has gone down quite well across our health boards, apart from in (isolated places) where we had a small mutiny of people refusing to use the new strips.'

'I think that's where having someone to oversee the implementation of the device is important.'

'I think we had one example where the devices went missing, so its always the worry on a busy ward of thing getting misplaced for a while especially when you might need them. Other concerns on the same line is if the device is faulty and no one reports its faulty etc.'

'Couple of occasions where it wasn't possible to place a sensor down the NG tube, it happened with a couple of patients but there was one in particular in which we really struggled. It didn't matter how hard to tried I just couldn't get the probe down.'

'A couple of nurse also mentioned that it was abit of a hassle that to make the probe fit you had to take the grip lock off the cheek sometimes.'

Q3: Should NGPOD replace pH testing strips?

'Here we have worked really hard to avoid x-rays so before the device came in we were already in a position of confidence that we don't over x-ray our patients, whereas in a trust with a CNS nutrition specialist or a strong Dietic presence on the ward this might nit be the case.'

'We have changed the culture here, years ago there was one patient who had 17 x-rays in a week due to NG tube management.'

Q4: Do you think that there needs to be more oversight or training involved with regards to NGPOD?

'Knowledge and training is how we keep people safe, not necessarily devices, it's the knowledge and training you give your staff. So if you have someone driving that in a health board that will make a difference.'

'(for this to work) This has to be supported by the health board.'

'There needs to be a more phased approach to training rather than just one training day at the beginning.'

'If we did take on NGPOD we would need to make sure when people did their NG tube insertion training that they also did NGPOD training and have people be observed using the device.'

'It needs to be competency based training, competency based training on new devices always works better.'

'There needs to be an element of observational based training on actual patients. What you learn in a one off teaching session is usually not going to be enough. Troubleshooting with the trainee will always provide people with better competency and confidence.'

Q5: Do you find the NGPOD easy to use? and to remember how to use when you can say you haven't used it for a while?

'I think the training and the device is very simple to use.'

'I don't think it would take much to keep peoples skills up.'

'It (the training) needs oversight from a specialist.'

'There needs to be someone (NGPOD champion) in a health board or trust that uses it in the right way and right places.'

'One of the bigger issues is when people who haven't used it in a while go to pick it back up and need a refresher they don't know who to go to, and the person they do go to also hasn't used it in a while. Which might not be due to the device itself but due to it being a new device.'

Q6: In general, did you find using the NGPOD was quick? Was it quicker or slower process than aspirate and pH strips?

'It was very quick to use if you know what your doing.'

Q7: Did you have any comments on the actually NGPOD design?

'From a safety point of view this was an issue for me, once you have opened a box the packaging on the individual sensors doesn't really tell you what is the cm marking on the sensor or which tube it is used for, which is a safety issue for me. I think not having the sensor marked on the sensor is an issue. We got around it my writing on each sensor pack what tube it goes with.'

'If the sponsors don't have the wording its hard to tell. There needs to either be a marking on the sensor or a colour code system so its easy to pair the tube with the sensor.'

'Labelling is so important.'

Q8: Do you have any examples of using the NGPOD you would like to share?

'We had one patient who we were using Aspirate testing on initial placement as per our guidelines, but the pH was showing up as a 6, she had x-rays but due to her size it was not clear whether the tube was in the correct place, which was only confirmed by a Radiologist, where it was almost impossible to see the NG. Interestingly they were using the NGPOD on her and it was showing as green.'



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