

Ambu aScope2 for use in unexpected difficult airways

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Site Demonstrator Pack

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Executive summary

The Ambu aScope2 system is a sterile, single-patient use endoscope and reusable monitor that is used to overcome problems with endotracheal intubation in patients whose airways make them difficult to intubate.

This site demonstrator pack has been developed to provide practical information and advice on implementing NICE's medical technology guidance on the Ambu aScope2. It is intended for use by both clinical and non-clinical staff responsible for adoption.

Discussions with current users of the Ambu aScope2 suggested a number of benefits of its use in difficult airways management. These included improved access to endoscopes, ease of use, speed of set up and portability. The learning gained from existing users is presented as a series of examples of current practice rather than suggested best practice.

NICE medical technology guidance 14 ([MTG14](#)) specifically relates to the Ambu aScope2 and the associated published evidence. During development of the NICE guidance the manufacturer released the Ambu aScope3. As this product is now available to purchase and in order to support NHS Trusts with their decision making, an overview of the new functions has been included.

Users of this pack should note that use of fibre optic and video endoscopes is a highly technical and skilled procedure that should only be carried out by a suitably qualified professional.

Introduction

There are approximately 2.9 million general anaesthetics administered in the NHS each year. Of these, endotracheal intubation is used for 1.1 million cases (38%). Although the vast majority of these procedures are performed without problems, difficulties with endotracheal intubation are expected in approximately 22,000 (2%) cases. In 10% of these, awake fibre optic intubation is undertaken ([NAP 4](#)).

In addition to this, NICE MTG14 states that approximately 12,000 tracheostomies and 5000–8000 percutaneous dilatational tracheostomies are carried out in the UK each year. A [study by McGrath and Thomas](#), published in 2010, examined critical airway incidents in intensive care units between 2005 and 2007. It reported a total of 453 clinical incidents, 338 of which led to harm and 15 that may have contributed to death. In total there were 276 incidents involving tracheostomies becoming blocked or displaced.

Although an unexpected difficult intubation or displacement of a tracheostomy tube is relatively rare, the consequences for the patient can be catastrophic. Potential health impacts can range from tissue damage and localised trauma through to brain damage and death caused by hypoxia.

In order to reduce this clinical risk, operating theatres and intensive care units carry a range of equipment that enables the anaesthetist to safely manage patients with difficult airways. This may include:

- Alternative laryngoscope blades
- Fibre optic laryngoscopes
- Aintree Intubation Catheters
- Laryngeal mask airways
- Intubating laryngeal mask airways
- Tracheal tubes
- Bougies
- Cricothyroid cannula

As part of their more advanced airway management equipment, most operating theatres and intensive care units will also have access to one or more multiple-use fibre optic endoscope.

NICE guidance MTG14 states that ‘placement of an endotracheal tube guided by a multiple-use fibre optic endoscope is the gold standard for managing difficult intubation. Using a fibre optic endoscope or a video scope allows visualisation of the vocal cords followed by accurate placement of an endotracheal tube’.

Current practice

The [Difficult Airways Society guidelines](#) outline the clinical strategy for intubation by direct laryngoscopy with no predicted airway problem or risk of regurgitation. 'Plan A' describes direct laryngoscopy as the initial standard technique for intubation. If this fails after 4 attempts, the secondary tracheal intubation plan (Plan B) is initiated.

Plan B involves the placement of a supraglottic airway device such as a laryngeal mask (LM) or intubating laryngeal mask (ILMA). Once the patient has been stabilised and is adequately oxygenated, secondary intubation can be attempted. Secondary intubation is performed through the supraglottic device (ILMA or LM). The Difficult Airway Society recognises that blind intubation through an ILMA has a high success rate, but promotes a visual fibre optic technique.

Due to the inherent nature of unexpected difficult intubation, it is important that all the relevant equipment is close to hand and immediately available as difficult intubations may quickly escalate into clinical emergencies. It is therefore important that a fibre optic or video endoscope is also available without delay.

Availability

Although most operating theatres and intensive care units have access to fibre optic endoscopes, common situations which might reduce this availability include:

- The requirement to sterilise multiple use endoscopes after every use and every 72 hours when not used. This is commonly carried out in a central endoscope processing unit and will remove the endoscope from use for a number of hours.
- Use of an endoscope out of routine working hours, such as during the night or when the processing unit is closed, may result in the equipment being removed from service for up to 2 days.

- The need for multiple use endoscopes to be regularly maintained and on occasion repaired.

If the operating theatre or department only have access to a limited number of endoscopes, any interruptions in service can have a dramatic effect upon endoscope availability.

Remote location

Discussions with existing NHS users has suggested that the storage of fibre optic endoscopes may be some distance from where they are needed, for example, in a different department or building. In this situation, and at the time of trying to manage an unexpectedly difficult airway, the equipment is therefore effectively rendered as 'unavailable' for use.

Experience and knowledge

When a patient presents with an unexpected difficult airway during intubation, the anaesthetic assistant (a staff nurse or operating department practitioner) may be asked to retrieve the difficult airway equipment and/or a multiple use fibre optic endoscope. One NHS organisation was able to cite an example where, as the use of fibre optic endoscopes was not routine within an operating theatre, the experience and knowledge required to locate, assemble and test the equipment was in need of updating.

Case report

A patient who was having cervical spine surgery was intubated without problems using a normal laryngoscope. The patient was put into the prone position and surgery commenced. However, 3 hours into surgery the patient could not be ventilated and started to de-saturate.

It was not initially clear what the cause of this problem was. Due to its ready availability, the Ambu aScope2 was deployed and on visualising the trachea, an obstructing mucoid plug was visualised. A fine bore suction catheter was then passed down the endotracheal tube and this resolved the problem allowing surgery to continue.

The advantage of the Ambu aScope2 in this situation was that the time it took to set up the equipment was very short when compared to a conventional multiple-use endoscope.

Why implement NICE's guidance on the Ambu aScope2?

The technology

NICE guidance [MTG14](#) specifically relates to the Ambu aScope2 and recommends its use in the management of unexpected difficult airway cases. During development of the guidance, Ambu Ltd. released the Ambu aScope3 system. Although the Ambu aScope3 falls outside of the scope of MTG14, further information is provided here in order to help NHS Trusts make fully informed procurement decisions.

Ambu aScope2

The Ambu aScope2 system consists of a single patient use flexible video endoscope and multiple-use aScope monitor. The system enables the operator to manage the difficult airway and overcomes the potential problems highlighted in the current practice section above. The aScope2 is presented in sterile packaging (expires after 3 years) and can be stored on a drip stand along with the aScope monitor. The system can then be located alongside other difficult airway equipment and is ready for immediate use with minimal set-up time.

The main benefits reported by NHS Trusts that regularly use the Ambu aScope2 are:

- Improved safety – having access to an endoscope immediately at the point of need.
- Avoidance of rare negative outcomes – rare but catastrophic negative outcomes such as brain damage and death can be reduced.



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- Reduced likelihood of re-scheduling of surgery – if an endoscope is available when required this may prevent patients with unexpected difficult airways needing their surgery to be re-scheduled.
- Reduced demand on multiple-use endoscopes.
- Ease of use in the hands of a skilled operator – does not require a new skill set to be learned.
- Easy to transport to the point of use.
- Endoscopes are packaged sterile and are single patient use so do not need to be disinfected prior to or following use.
- No maintenance – endoscopes are disposable are therefore do not need to be maintained.
- No need for repairs – the Ambu aScope2 is disposable. If it gets damaged during a procedure, this will have no major clinical or financial consequences in terms of endoscope unavailability or repair costs.

More [information on the Ambu aScope2](#) and a [downloadable data sheet](#) can be found on the Ambu website.

Ambu aScope3

The Ambu aScope3 is available in 2 variations, the Ambu aScope3^{5.0/2.2} and the Ambu aScope3 Slim^{3.8/1.2}.

Both of these use the new aView monitor.

These new endoscopes and monitor are updates to the Ambu aScope2 system and address a number of limitations present in the earlier versions. Specifically the Ambu aScope3, Ambu aScope3 Slim and aView monitor now have:



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- Suction port as an integral part of the endoscope.
- Placing and checking of narrower Double Lumen Tubes (Ambu aScope3 Slim).
- Placing of Bronchial Blockers (Ambu aScope3 Slim).
- Usable with the Aintree catheter (Ambu aScope3 Slim).
- A channel width of 2.2mm (Ambu aScope3) allows for suctioning of thicker secretions and a range of endoscopic accessories to be deployed.
- Touch-screen with improved image quality.
- Ability to take video recordings and photographs and upload data to a USB memory stick.

More information can be found on the Ambu website here:

[Ambu aScope3](#)

[Ambu aScope3 Slim](#)

[aView monitor](#)

Data sheets can be found here:

[Ambu aScope3](#)

[Ambu aScope3 Slim](#)

[aView monitor](#)

The following tables provide a direct comparison of the different aScope versions and monitors.

| | aScope2 | aScope3 | aScope3 Slim |
|---|---|-------------------|---------------------|
| Field of view | 80° | 85° | 85° |
| Depth of field | 9mm-18mm | 8mm-19mm | 8mm-19mm |
| Illuminating method | 2 x LED | 2 x LED | 2 x LED |
| Bending section | up 120° down 120° | up 150° down 130° | up 130° down 130° |
| Insertion cord diameter | 5.4mm | 5mm | 3.8mm |
| Min ET tube inner diameter | 6mm | 6mm | 5mm |
| Min double lumen diameter | 41Fr | 41Fr | 37Fr |
| working length | 630mm | 600mm | 600mm |
| Luer/inner/working channel | 0.8mm | 2.2mm | 1.2mm |
| O ₂ max flow rate | 2.2Lpm | no max | no max |
| Qty per box | 5 | 5 | 5 |
| Order code | 400 002 005 | 403 001 000 | 402 001 000 |
| Price direct from company ¹ | £179 (ex VAT) | £199 | £199 |
| NHS Supply Chain price ² | £232.75 (ex VAT) | NA | NA |
| Notes | | | |
| 1 | This is an average price and is subject to change | | |
| 2 | aScope3, aScope3 Slim and aView monitor will be added to NHS Supply Chain catalogue in due course | | |
| Please note all prices accurate as of July 2013 | | | |

| | aScope Monitor | aView Monitor |
|---|---|----------------------|
| Max resolution | 640 x 480 | 800 x 480 |
| Display type | 6.5" colour LCD | 8.5" colour LCD |
| Start-up time | approx. 10 seconds | approx. 1 second |
| Power requirement | 10-15V DC input | 18v 1,67A DC input |
| Battery type | 7.4V 2200mAh Li-ion | 11,1V 3760mAh Li-ion |
| Weight | 1150g | 1500g |
| USB Connection | none | type A |
| Video signal | NTSC | NTSC/PAL |
| Hard drive memory | NA | 16 GB |
| Video record function | no | yes |
| Photo function | no | yes |
| Min battery time | 2 hours | 3 hours |
| Compatible with | aScope2 | aScope2, 3 & 3 Slim |
| Touchscreen | no | yes |
| Order code | 401 001 001 | 403 001 000 |
| Price direct from company ¹ | £799 (ex VAT) | £1699 (ex VAT) |
| NHS Supply Chain price ² | £921.93 (ex VAT) | NA |
| Notes | | |
| 1 | This is an average price and is subject to change | |
| | aScope monitor is available free with initial purchase of 5 x aScope2 | |
| | aView monitor is available free with initial purchase of 10 x aScope3/aScope3 Slim (until end 2013) | |
| 2 | aScope3, aScope3 Slim and aView monitor will be added to NHS Supply Chain catalogue in due course | |
| Please note all prices accurate as of July 2013 | | |

Case report

The following example occurred on a large general intensive care unit and provides an illustration of the issues that can arise when using multiple-use endoscopes. The unit has an adjacent storage cabinet which holds up to 6 multiple-use fibre optic endoscopes. This includes:

- 2 intubating fibre optic laryngoscopes with direct view via eye-pieces
- 1 bronchoscope with direct view via eye-piece
- 2 bronchoscopes with image only viewable via a separate 'stack' system
- 1 self-contained intubating fibre optic laryngoscope with integrated digital video screen

A critical incident occurred one night whereby an unexpected difficult intubation occurred following induction of anaesthesia in the ICU. It was not possible to intubate the patient using conventional direct laryngoscopy with a variety of laryngoscope blades. However, it was just possible to ventilate the patient using a bag-valve-mask system. Ventilation was not improved using a supraglottic airway device as a rescue technique.

A fibre optic endoscope was requested by the anaesthetic trainee managing the airway and a healthcare assistant was sent to 'get the scope'. The multiple-use endoscopes were retrieved from the storage cabinet.

The first endoscope brought was one of the bronchoscopes which required the digital stack system for a light source and to view the image. This was not suitable for emergency airway management.

A second endoscope was brought which was the self-contained intubating fibre optic laryngoscope. Unfortunately, the battery had not been left on charge and was flat, meaning that the endoscope would not function.

A third endoscope was therefore brought to the bedside which required a separate light source. The battery had been locked in a cupboard as it had been considered too expensive to leave 'lying around'. Night staff were not aware of the mains-powered light source available for this endoscope which was located in the adjacent theatre.

A fourth endoscope was therefore summoned from the nearby operating theatre suite which unfortunately again arrived without a light source.

One of the attending senior nursing staff then brought an Ambu aScope2 to the bedside and this was used to intubate the patient uneventfully.

Throughout this incident, the patient remained relatively stable although a definitive airway was not established for around 10 minutes.

While this sequence of events may be unusual, this critical incident clearly illustrates some of the factors that may occur when using multiple-use endoscopic devices and the need for robust processes be in place to reduce the risk of them occurring. These factors include a lack of familiarity with the variety of equipment available, out-of-hours emergency care and the storage and functionality of multiple-use endoscopes.

The Ambu aScope2 was stored in the ICU, on a stand with the monitor and once brought to the bedside, offered an immediately available integrated solution to the emergency difficult intubation.

Evidence for the technology

The recommendations in the medical technology guidance are based on clinical evidence which included 11 studies. Of these, 3 studies evaluate the Ambu aScope2 and 8 evaluate its predecessor, the Ambu aScope. These studies comprise of 4 published and 2 unpublished randomised controlled trials and 5 published case series reports. Full details of the clinical evidence base can be found in the [assessment report overview](#).

The rationale for adoption

| <i>Driver</i> | <i>Measure</i> |
|---|--|
| NICE MTG14 | 1.1 The case for adopting the Ambu aScope2 for use in people with unexpected difficult airways needing emergency intubation is supported by the evidence. This shows that the Ambu aScope2 is an acceptable alternative, where a multiple-use fibre optic endoscope is unavailable. There are also advantages during replacement of dislodged tracheostomy tubes in the intensive care setting. Making the Ambu aScope2 available for use across settings is likely to improve outcomes and improve patient safety. |
| Royal College of Anaesthetists – 4th National Audit Project (NAP4) recommendations | <ul style="list-style-type: none"> • All anaesthetists should be trained in low-skill rescue intubation through a supraglottic airway. A technique using the Aintree Intubation Catheter is recommended. • Fibre optic endoscopy should be immediately available to confirm airway device placement in situations where capnography may be misinterpreted. • A flexible fibrescope should be immediately available on the ICU to check position of tracheal/tracheostomy tubes and assist with fibre optic intubation or percutaneous tracheostomy placement. |
| Difficult Airway Society | Strategy for intubation by direct laryngoscopy, no predicted airway problem, no risk of regurgitation. |

| | |
|--|--|
| The Outcome Framework for the NHS in England 2013-14 | <p>Domain 5: Treating and caring for people in a safe environment; and protecting them from avoidable harm. The overarching indicators for this domain are:</p> <ul style="list-style-type: none"> • Patient safety incidents reported • Safety incidents involving severe harm or death • Hospital deaths attributable to problems in care |
| Innovation, Health and Wealth (2011) | <p>Innovation, Health and Wealth: accelerating adoption and diffusion in the NHS was published in December 2011. It cites its aims to:</p> <ul style="list-style-type: none"> • Deliver productivity savings to meet growing demand for services • Improve the quality of care and services for patients • Reduce variation in the NHS, drive greater compliance with NICE guidance |

Royal College of Anaesthetists – 4th National Audit Project

The 4th National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society ([NAP4](#)) was designed to answer the questions:

- What types of airway device are used during anaesthesia and how often?
- How often do major complications, leading to serious harm, occur in association with airway management in anaesthesia, in the intensive care units and in the emergency departments of the UK?
- What is the nature of these events and what can we learn from them, in order to reduce their frequency and consequences?

The results of this national audit were published in March 2011 along with recommendations for improvements in practice. During the development of this Site Demonstrator Pack, it became apparent that most of the NHS Trusts visited had conducted some form of gap analysis to measure their own performance against these recommendations.

The following links may help NHS Trusts who wish to undertake any similar local improvements.

[NAP4 - Major complications of airway management in the United Kingdom](#)

[Ambu NAP4 Anaesthesia guide](#)

[Ambu NAP4 Emergency department guide](#)

[Ambu NAP4 ICU guide](#)

Demonstration site learning

Background

During the development of this site demonstrator pack, the Health Technologies Adoption Programme (HTAP) at NICE worked with the manufacturer, Ambu Ltd. to identify NHS Trusts who were using the Ambu aScope2. Trusts voluntarily agreed to provide structured feedback on their experiences of using the technology.

The examples included in this pack are offered as 'real life' examples of how the technology is currently being used within the NHS. NICE has not assessed whether they represent best practice so they should not be taken as such. These trusts were not limiting their use of Ambu aScope2 to the scope of MTG14 and so readers will want to be aware that some of the uses reported extend beyond the scope of the NICE guidance. These uses were not evaluated by NICE during development of the guidance.

Site by site case studies

County Durham and Darlington NHS Foundation Trust

Darlington Memorial Hospital is part of County Durham and Darlington NHS Foundation Trust and provides major acute services to a population of approximately 130,000 people. It has a full range of outpatient clinics and diagnostics, inpatient surgery, children's services and consultant-led maternity services. It also handles emergency trauma and other major surgery.

Clinicians in Darlington started using the Ambu aScope2 in 2011. They use Ambu aScope2 mainly in an intensive care setting for the placement and replacement of percutaneous tracheostomy tubes.

Although there were 3 multiple-use endoscopes available within the theatre suite and 2 multiple-use endoscopes in intensive care, they found that the use of Ambu aScope2 provided immediate access to an endoscope and reduced the risk of multiple-use endoscopes becoming damaged during tracheostomy placement.

A business case was written based upon the cost of maintenance of multiple-use endoscopes and the clinical need to reduce the risk of delayed tracheostomies due to an endoscope not being available. Darlington currently use between 7-10 aScopes each month and also now have the use of one new multiple-use endoscope following the decommissioning of the 2 older multiple-use endoscopes. This has reduced maintenance costs and has helped to fund the disposable endoscopes.

The intensive care unit has 2 aScope monitors and these have reduced the potential for occasions when there is no endoscope available or having to fund costly repairs.

Training was provided by the manufacturer, Ambu Ltd, onsite in intensive care and theatre and this has been continued in-house with the use of a training endoscope and manikin.

The main benefits of introducing the Ambu aScope2 for Darlington were:

- Flexibility – although the endoscopes are mainly used in ICU, they can be easily transported and used in any location required.
- Endoscopes are excellent for training purposes – no risk of damage.
- Safety – endoscope available immediately when required.
- No risk of costly damage to a non-disposable scope when inserting percutaneous tracheostomies.
- No need for sterilisation of endoscopes increases availability.

Harrogate and District NHS Foundation Trust

Harrogate District Hospital is run and operated by Harrogate and District NHS Foundation Trust, providing health care to people in Harrogate and North Yorkshire.

Clinicians at Harrogate District Hospital have used the Ambu aScope2 since 2011 and introduced its use into the Emergency Department (ED), the intensive care unit, general theatre and maternity theatre. Theatres also have access to a multiple-use endoscope system.

The Ambu aScope2 is predominantly used for the management of unexpected difficult airways. It has been particularly useful in areas of higher airway risk such as the ED resuscitation room for trauma patients and in obstetric theatre. Ambu aScope2 is also used within intensive care for the insertion and re-insertion of percutaneous tracheostomies.

As the total cost of the project was less than £5000, no formal business case was required. An agreement was made between critical care and ED to jointly fund the introduction of Ambu aScope2 from endowment funds. As the equipment was not in standard use within the trust, a request had to go to the Trust Equipment Group for agreement. An example of this process and relevant form can be found in appendix 1.

The main benefits of using the Ambu aScope2 are noted to be:

- Ease of use – the endoscope is quick and simple to set up and use.
- Safety – immediacy and availability of use.
- Availability – the trust had previously had a period during which their non-disposable endoscope was broken and being repaired. Ambu aScope2 can now fill this gap in provision.
- Assisting the trust to fulfil the recommendations of [NAP 4](#).

The Mid Yorkshire Hospitals NHS Trust

The Mid Yorkshire Hospitals NHS Trust provides community, acute and specialist health services to around half a million people living in the Wakefield and North Kirklees areas. The trust completed a major hospital development programme in March 2011, which involved opening new hospitals in Wakefield (Pinderfields) and Pontefract.

Following the move to the new hospitals at Pinderfields and Pontefract, all fibre optic endoscope cleaning was transferred to the endoscopy department. This enabled the required tracking and tracing to take place and ensured disinfection was of the highest possible specification.

Although the operating theatre is situated next to the endoscopy unit, when the unit was not open, there was no practical out-of-hours service for the cleaning of multiple-use fibre optic endoscopes. A new solution had to be found that provided 24 hour access to endoscopes.

The Ambu aScope2 was used in the theatres at both sites to supplement the use of multiple-use endoscopes which are still used for known or anticipated difficult airways. The aScope 2 forms part of the difficult airway equipment in the operating theatre and is the endoscope of choice for difficult airways out of hours. A multiple-use endoscope can still be used out of hours upon the request of a consultant. However, this would take some time and would not be suitable for the emergency situation.

Training was initially provided by the manufacturer and this is now done in house with the use of a training endoscope. The trust also used the Ambu aScope2 on real subjects during an awake intubation course held at the trust.

University Hospitals of Morecambe Bay NHS Foundation Trust

The Royal Lancaster Infirmary has 491 beds and is operated by University Hospitals of Morecambe Bay NHS Foundation Trust. The key treatments, specialisms and services offered at Royal Lancaster Infirmary include emergency department, oncology unit, critical care unit, maternity and special care baby unit.

Clinicians at The Royal Lancaster started using the Ambu aScope2 in 2012 and it is currently used in both theatre and A&E. The Ambu aScope2 currently supplements their multiple-use endoscopes of which they have access to 2 (1 standalone system and 1 stack system).

The introduction of Ambu aScope2 was the direct result of a change in the decontamination procedures for the multiple-use endoscopes. All endoscopes are cleaned within the endoscopy department which is locked overnight and out of hours. A new system was therefore required as an urgent service requirement and the aScope was introduced to fill this gap in provision. As this was considered a 'must do' – no business case was required and aScopes were ordered and used as required.

The trust runs a parallel model of service provision with the multiple-use endoscopes being used for known or anticipated difficult airways, supplemented by Ambu aScope2 for use in unexpected difficult airways or where multiple-use endoscopes are not available.

The endoscopes are stored within the theatre suite and form part of a stepped approach to difficult airway management. The Ambu aScope2 is located with the monitor on a drip stand, adjacent to the difficult airway trolley. This allows prompt deployment as required.

The key benefits of Ambu aScope 2 at the Royal Lancaster were noted to be:

- The simplicity of the system.
- Immediate availability of an endoscope at the point of clinical need.
- The aScope 2 has also helped the trust with its implementation of the [NAP 4](#) recommendations.

Salford Royal NHS Foundation Trust

Salford Royal NHS Foundation Trust provides University Teaching Hospital, community and primary care services to the city of Salford and specialist services to Greater Manchester.

Due to the high number of ENT, spinal and neurosurgery cases undertaken by the trust there is a high incidence of difficult airways with approximately 5 fibre optic endoscopes undertaken per week as part of intubation. Although there are approximately 5 multiple-use endoscopes available, access is not always possible and is dependent upon the location of the patient and where the multiple-use endoscopes are situated across a geographically large hospital site.

In order to improve this situation, the trust started using the Ambu aScope2 8 months ago following an initial trial of endoscopes during which training for doctors and operating department practitioners (ODPs) took place.

A business case was submitted for 24 Ambu aScope2s at £200 each including 3 monitors that would be used over a 12 month period. However the Ambu aScope2 proved so popular with anaesthetists that 52 endoscopes

were used in 6 months. This level of use was not sustainable and criteria for use were revised.

Multiple-use endoscopes are still regularly used and the Trust now runs a parallel model using a combination of multiple-use and disposable endoscopes.

Currently the Ambu aScope2 is situated alongside the emergency airway equipment and is ready for immediate use. Anaesthetists have also used the equipment in remote locations in the hospital when called to emergency situations.

The main benefits of using this technology were reported to be:

- Reliability of the system.
- Availability of a video scope at the immediate point of need.
- Easily transported to wherever required. The clinicians at Salford also report improvements in clinical risk management as a result of using this technology.

University Hospital of South Manchester NHS Foundation Trust (UHSM)

UHSM is a major acute teaching hospital trust providing services for adults and children at Wythenshawe Hospital in South Manchester. The Trust has over 140 multiple-use endoscopes used in a variety of clinical settings.

The ICU at UHSM has 6 multiple-use endoscopes in current use. This includes the use of one high specification bronchoscope. Alongside these, the ICU also uses the Ambu aScope2 in unexpected difficult airways.

The ICU has used the Ambu aScope2 since it was first released and their use is now fully embedded with approximately 3 endoscopes being used per month.

The wider hospital have found the Ambu aScope2 particularly useful in more isolated environments such as the Maternity Theatre Suite, the Day Case Surgical Unit and the wards that care for patients with tracheostomy tubes.

Particular reported benefits include:

- Immediate availability in a clinical emergency.
- Having an Ambu aScope2 at the bedside of a predicted difficult airway without having to de-sterilise a multiple-use endoscope.
- Availability is not affected by high throughput procedures which would remove multiple-use endoscopes from the clinical areas for cleaning and lead to delays in subsequent procedures. This includes elective cleaning of endoscopes as part of their 72 hour disinfection schedule.
- Reduced repair bills for damaged multiple-use endoscopes. Each repair usually costs between £2000-4000 when an endoscope is damaged during use. Use of the Ambu aScope2 is therefore especially useful for less experienced clinicians who are more likely to damage multiple-use bronchoscopes or procedures where damage is more likely to occur.
- Quick set up and deployment.
- Simple disposal after use, not requiring a member of staff to be removed from the clinical area and eliminating portering delays.

The governance leads for the cardiac theatre/ITU, general ITU, general theatre and wards meet up to discuss clinical cases, incidents and to track successes. This approach has allowed the trust to carefully monitor endoscope use and identify occasions when it might have assisted patient care so they can make adjustment to provision as required.

UHSM currently runs all its own in-house training and also offers national and regional training to other clinicians.

The Trust is currently trialling the Ambu aScope3 and Ambu aScope 3 Slim. It has no immediate plans to decommission any of their multiple-use endoscopes but may consider this as an option when the working life of some of their current endoscopes comes to an end.

How to implement NICE's guidance on the Ambu aScope2

Project management

During the development of this pack, a number of potential implementation hurdles were reported by NHS sites. These issues and their solutions are discussed in more detail [here](#). They include:

- Lack of familiarity with the evidence base for the new technology.
- Limitations of the technology.
- Resistance to change.
- Lack of experience with new equipment.
- Lack of funding prioritisation.

Our experience suggests that a project management approach will allow these hurdles to be managed effectively. This section discusses this approach in detail.

Project implementation teams

Our experience has shown that successful implementation of medical technologies is best supported using a systematic and team-based approach. A first and crucial step should be the formation of a local implementation team who together work to oversee and drive the required clinical and system changes. The formation and membership of this team and the duration of the project will depend upon the technology in question and upon the local situation.

For the implementation of the guidance on Ambu aScope2, the suggested membership of the implementation team is listed below.

- Clinical Champion – Consultant Anaesthetist with responsibility for clinical leadership, directing clinical education and training programmes and protocol development for Ambu aScope2 use. This person may also have clinical responsibilities for equipment purchasing or have an interest in difficult airway management.

- Management Sponsor - the management sponsor may be at directorate, divisional or board level. They will have a vital role in formation of and gaining agreement to the business case. He/she can also champion implementation and influence stakeholders to give backing to the project.
- Project Manager - responsible for the local management of the project, ensuring a systematic approach to implementation. They are also responsible for the development of project plans including the development of a business case and the provision of adequate resources for sustainable implementation. This person may be a doctor, nurse, ODP or a manager. In all cases, this person should be allocated enough time to undertake the role.
- Clinical Audit Facilitator - responsible for the development and implementation of data collection to measure impact of the new technology. This person may be a regular member of the implementation team or requested to attend on an ad-hoc basis.
- Procurement - when planning the implementation of the Ambu aScope2, it is important that NHS organisations always engage with their local procurement (supplies) department. They will be able to negotiate with the manufacturer and/or NHS Supply Chain to ensure the best possible price for the product.
- Other clinical staff – a nurse or an ODP may also be a valuable member of the implementation team. This person can disseminate information to their peers, be a good advocate for the project and their involvement will increase engagement.

The workload of the implementation team will vary depending upon which stage of the implementation an organisation has reached. Initially work should centre on:

- Devising a project plan
- Establishing the need for / preparing a business case
- Setting baseline metrics (parameters for evaluation)
- Ensuring effective communication of the project to all involved.

Early questions that the implementation team must consider include:

- Is there a clear understanding of the Ambu aScope2 and its potential impact on patient care?
- How will the Ambu aScope2 be managed and used alongside our existing multiple-use endoscope provision?
- What changes need to be implemented trust-wide to ensure successful implementation of this technology?
- What is the mechanism for measuring and reporting outcomes?
- Who is responsible for capturing the required data and reporting back to the implementation team?
- Are there any obvious hurdles that will need to be overcome and how can this be achieved?
- Have all necessary stakeholders been identified and engaged?
- Once adopted, when will we evaluate the use of Ambu aScope2 within our trust?

As the project progresses, the implementation team will focus upon driving delivery, overcoming any operational difficulties, monitoring progress, checking that the anticipated benefits are being realised, ensuring that the project is running to the agreed timeframe and identifying corrective change if needed.

Towards the end of the project, the implementation team will focus upon evaluation of the project and on documenting the data and rationale for the sustained and continued use of the technology beyond the project end.

Measuring success – setting metrics

In order to demonstrate benefits of the Ambu aScope2, it is important to take measurements before, during and after implementation. This will enable real-life benefits to be measured and built upon.

It is the remit of the implementation team to decide upon which metrics are the most relevant for their circumstances. These should be linked to the benefits identified within the business case.

For the implementation of the Ambu aScope2 the following metrics are recommended:

- Number of intubations
- Number of unexpected difficult intubations
- Incidents of delayed access to multiple use endoscopes
- Number of percutaneous tracheostomies performed
- Incidents of damaged multiple use endoscopes
- Number of dislodged percutaneous tracheostomies
- Number of aScopes used

In addition to the above, implementation teams may also wish to review historical and current critical incidents to undertake root cause analysis. This may reinforce the case for long-term adoption of the Ambu aScope2.

Procurement consideration

Local trust procurement rules will apply and implementation teams should seek advice from their local procurement departments regarding potential purchases of equipment. If products are bought directly from the NHS Supply Chain, there is no need for a formal tendering process to take place and this can be very helpful when trying to adhere to a tight timeframe.

It is worth noting that, at the time of publication, Ambu is offering a free aScope monitor with the initial purchase of 5 x Ambu aScope2 and a free aView monitor¹ with the purchase of 10 x Ambu aScope3/Ambu aScope3 Slim (or combination of both types). If the aScopes are purchased direct from NHS Supply Chain, the free monitor will be dispatched directly by Ambu Ltd.

¹ The aView monitor offer is valid until December 2013

Workforce considerations

Staffing

Whilst visiting NHS sites to discuss the use of Ambu aScope2, HTAP found that the impact of implementation upon staffing is minimal. The Ambu aScope2 does not introduce any new clinical techniques, move the setting of care or impact upon current role boundaries.

Training

Training staff to use the Ambu aScope2 is initially undertaken by the manufacturer. Ambu have a Training Specialist in Airway Visualisation who offers bespoke training to NHS sites. Training may then be disseminated within a department with an anaesthetist or senior ODP usually taking the lead.

The format of the training is dependent upon the needs of the department and the staff. This usually involves a short talk and explanation of the equipment followed by a hands-on session during which staff can practice using an aScope on a manikin. Although in clinical use the endoscope is only used by a skilled anaesthetist, to increase familiarity it is useful to allow all staff to have hands-on experience in a training scenario.

If the training is for a group of clinicians it will focus on the features of the endoscope, how to use the endoscope and in what scenarios it should be used. This is followed by a hands-on session. This practical approach helps medical staff to feel confident to use the endoscope in clinical practice.

If training is for a group of ODPs or nurses, more emphasis will be placed upon the set-up and use of the monitor as well as the opportunity for a hands-on session.

Although a training version of the Ambu aScope2 is available, training can also be carried out using a regular Ambu aScope2. If the sterility of an aScope is about to expire, using this endoscope for in-house training can be a cost effective alternative to disposal.

Business case and costing

Business case

In order to demonstrate to budget holders the benefits and viability of acquiring disposable endoscopes, a business case may need to be written. The business case will detail all the costs and project exactly how these will be met, for example through re-prioritisation of existing revenue budgets or allocation of funds from equipment or capital budgets.

The implementation team should treat the development of a robust business case as an early priority in the life of the project. It is also very important, as the project progresses, that the business case is re-visited to ensure that the projections it contains are working out in reality. If the reality does not match the projections, forecasted changes should be made to the business plan and the viability of the project re-assessed by the implementation team.

Local arrangements for approving business plans will vary from trust to trust and each trust is likely to have its own template and process in place. A simple example business case template for Ambu aScope2 is available in appendix 2.

Payment by results

The use of the Ambu aScope2 does not affect Payment by Results and will have no direct effect upon the tariff payments made to Trusts.

Projecting local costs and savings

During the development of MTG14, the costs and potential savings were modelled for 5 clinical settings:

- An isolated hospital unit
- An obstetric unit
- An operating theatre unit
- An intensive care unit
- Displaced tracheostomy tubes (in an intensive care unit)

Potential cost savings were modelled on the basis of avoidance of future care costs for patients who suffered hypoxic injuries where multiple use fibre optic endoscopes were unavailable for use.

NICE has also produced a [costing statement](#) that will help implementation teams consider the likely cost impact and any costs that may be avoided by implementing the guidance.

Implementation teams should take time to accurately assess the potential costs and areas in which future costs can be prevented as part of the business plan.

The costs and potential savings reported by the NHS sites were:

Costs

- Purchase of aScopes
- Purchase of monitor (may be included in initial purchase of 5 x Ambu aScope2)
- Purchase of training endoscope
- Releasing staff for training
- Wastage

Potential savings

- Avoiding rare negative outcomes
- Reduced length of stay
- Avoiding delayed or re-scheduled surgery
- Reducing demand on multiple use endoscopes
- Reduced endoscope cleaning costs
- Reduced risk of damage to multiple-use endoscopes

Overcoming implementation hurdles

As with any new initiative, the adoption of a new medical technology will inevitably need to overcome hurdles as the implementation progresses. These issues will need to be discussed by the implementation team and local solutions sought.

During discussions with the NHS sites using the Ambu aScope2, the following implementation hurdles were reported.

| <i>Staff affected</i> | <i>Hurdle</i> | <i>Solution</i> |
|------------------------------|---|--|
| Clinical staff | Some sites experienced initial resistance to change in daily clinical practice. | Clinical staff were given the opportunity to use the Ambu aScope2 in a training session and to discuss clinical utility with the company representative. This answered the concerns of those clinicians and identified the benefits in deploying the Ambu aScope2 in certain scenarios. For example, when multiple-use endoscopes are not available or are required in an emergency. |
| | Uncertainty about the evidence base. | Peer to peer discussions regarding the evidence base were held. This was led by the clinical champion for the project. Further detail regarding the evidence base can be found in MTG14 |

| | | |
|-----------------------|---|--|
| | <p>Limitations of the Ambu aScope2. Concerns were raised by some clinicians regarding the limitations of the Ambu aScope2. These included: a lack of a suction port, no channel to allow use of endoscopic accessories, not compatible with the Aintree intubation catheter, and a poorer quality picture when compared to multiple-use endoscopes.</p> | <p>The solution to this was to explain to clinicians that the Ambu aScope2 is not intended to replace multiple-use endoscopes but rather to facilitate intubation in unexpected difficult airways. Once clinicians were given the opportunity to use the endoscope for the intended use of intubation, the majority of their concerns were alleviated.</p> |
| | <p>Lack of regular use and familiarity discourages staff from using the Ambu aScope2.</p> | <p>In response to requests raised by the clinical community, Ambu Ltd. have released the updated Ambu aScope3. This version of aScope has a suction port, it allows the introduction of endoscopic tools, is compatible with the Aintree intubation catheter (aScope 3 Slim) and has an improved picture quality.</p> |
| <p>Trust managers</p> | <p>As the Ambu aScope2 does not facilitate the decommissioning of multiple-use</p> | <p>Initial educational input from the manufacturer followed by annual refresher updates in-house helped staff to feel familiar with and comfortable using the equipment. A local 'training endoscope' enabled this to be conducted locally.</p> <p>A business plan based upon costs, savings and potential clinical benefits will help managers to prioritise budgets accordingly. See</p> |

| | | |
|--|--|--|
| | endoscopes, funding will need to be sourced. | the NICE costing statement for more information. |
| | The need to develop a business case can be viewed as being complicated and time consuming. | An example business case is provided in appendix 2. The implementation team should develop the business case early on in the project. |
| | The concern that the over-use of single patient use endoscopes may cause an unplanned rise in costs. | Ambu aScope2 use should be closely monitored and any 'out of protocol' use addressed. One site found that staff liked using the endoscopes so much that they started using them for elective as well as unplanned cases. This caused a large rise in costs and subsequently use had to be limited to agreed scenarios. It is suggested that local agreement for use/protocol should be set up prior to the introduction of the Ambu aScope2. |

Risk management

All projects contain an element of risk. It is the responsibility of all members of the implementation team to help keep these risks at manageable levels.

The following table identifies specific risk areas and looks at the control measures available to mitigate those risks.

| <i>Risk area</i> | <i>Example control measure</i> |
|--|--|
| Lack of leadership to drive the project. | Nominate a Clinical Champion for the project. This could be an anaesthetist with a special interest in difficult airway management or the departmental lead for equipment. |
| | Ensure management involvement in the project group. This could be at directorate, division or board level. |
| Poor engagement with the project may lead to low use of technology and no realisation of benefits. | Identify and include all key stakeholders in planning and implementation. This should include anaesthetists, nurses, operating department practitioners, management representation and electro-biomedical engineering staff. |
| | Develop shared objectives and plan project milestones. |
| | Keep implementation teams fully informed of progress and problems. |
| | Ensure that a project manager or project lead is identified who will be responsible for day to day arrangements, organising meetings and other project specific tasks. |
| | Meet regularly with key staff. |
| | Communicate effectively with the wider hospital community. For example – the implementation team could produce a news item for the Trust newsletter. |
| | |
| Costs and benefits are unclear, threatening agreement to the project. | Prepare a robust business case. |
| | Address any unequal spread of costs and benefits. |
| | Work together with Trust finance department to track project costs. |

| | |
|--|---|
| Capability & educational needs of staff are not met. | Ensure communication and understanding of what is being implemented and why. |
| | Plan implementation thoroughly. |
| | Actively manage risks. |
| | Actively train and educate all stakeholders. |
| Poor quality data is a threat to project viability. | Plan for good quality data collection. Identify one person with overall responsibility for ensuring data collection and regularly reporting progress or issues to the implementation team. Set metrics that will allow for a meaningful baseline and subsequent data collection to be made. For example - number of intubations, number of unexpected difficult intubations, number of tracheostomy tubes inserted, number of tracheostomy tubes displaced, multiple-use endoscope usage. |
| | Ensure clear outcome measures are identified and accessible. |

Communications

In order to achieve successful and widespread adoption it is essential that all relevant stakeholders are communicated with. Unless each stakeholder has the opportunity to understand the reasons for the change in practice, they cannot be expected to support it. A comprehensive communications plan will help achieve this goal.

All those affected by the change, whether directly or indirectly, should have an opportunity to discuss the changes and the rationale underpinning them in detail, for example at departmental or audit meetings.

Communications should be planned to target the identified groups of staff and appropriate messaging and communications constructed for each of them. With widespread buy-in, the implementation and adoption process will be much smoother.

Examples of communications used during Ambu aScope2 implementations include the following:

- Discussion of the technology during staff meetings.
- Discussion of technology between the anaesthetist responsible for equipment and colleagues.
- Taking impromptu opportunities such as case reviews to discuss the use of the technology.
- Educational sessions during planned lunchtime teaching sessions and audit days.
- Information regarding the technology within a monthly 'theatre news' bulletin.

Top tips

The lessons learned throughout the implementation of Ambu aScope2 at the NHS sites are summarised here as top tips for implementation.

- Spend time defining where the Ambu aScope2 will fit into treatment pathways to ensure maximum benefit.
- Make sure everyone who needs to be involved in the pathway redesign is involved including anaesthetists, nurses, managers and Electro-Biomedical Engineering staff.
- Set and measure baseline metrics upon which to gauge improvements.
- Closely monitor Ambu aScope2 use to ensure actual use is in line with predicted (and budgeted) use.
- Organise initial training for all relevant staff and provide intermittent updates.
- Review all cases of unexpected difficult airways and displaced tracheostomy tubes. Audit fibre optic and video scope use against these cases.
- Keep the wider hospital community well informed regarding the project.
- Rotate endoscopes with shorter expiry dates into locations where use is higher. Alternatively use expired endoscopes for staff training sessions.

Support materials

- NICE guidance: [MTG14](#)
- Difficult Airway Society: <http://www.das.uk.com/>
- The Royal College of Anaesthetists: <http://www.rcoa.ac.uk/>
- The Royal College of Anaesthetists - NAP 4:
<http://www.rcoa.ac.uk/nap4/>
- Ambu aScope2:
http://www.ambu.com/corp/products/anaesthesia/product/ambu%C2%AE_ascope%E2%84%A2_2-prod14716.aspx
- Ambu aScope3:
http://www.ambu.com/corp/products/anaesthesia/product/ascope_3-prod17195.aspx
- Ambu aScope3 Slim:
http://www.ambu.com/corp/products/anaesthesia/product/ascope_3_Slim-prod17196.aspx

Appendices

Appendix 1 – Example of NHS Trust equipment purchase procedure

Purchase of standard and non-standard medical devices

The purchase of medical equipment should follow the principles outlined within the Trusts Management of Medical Devices Policy.

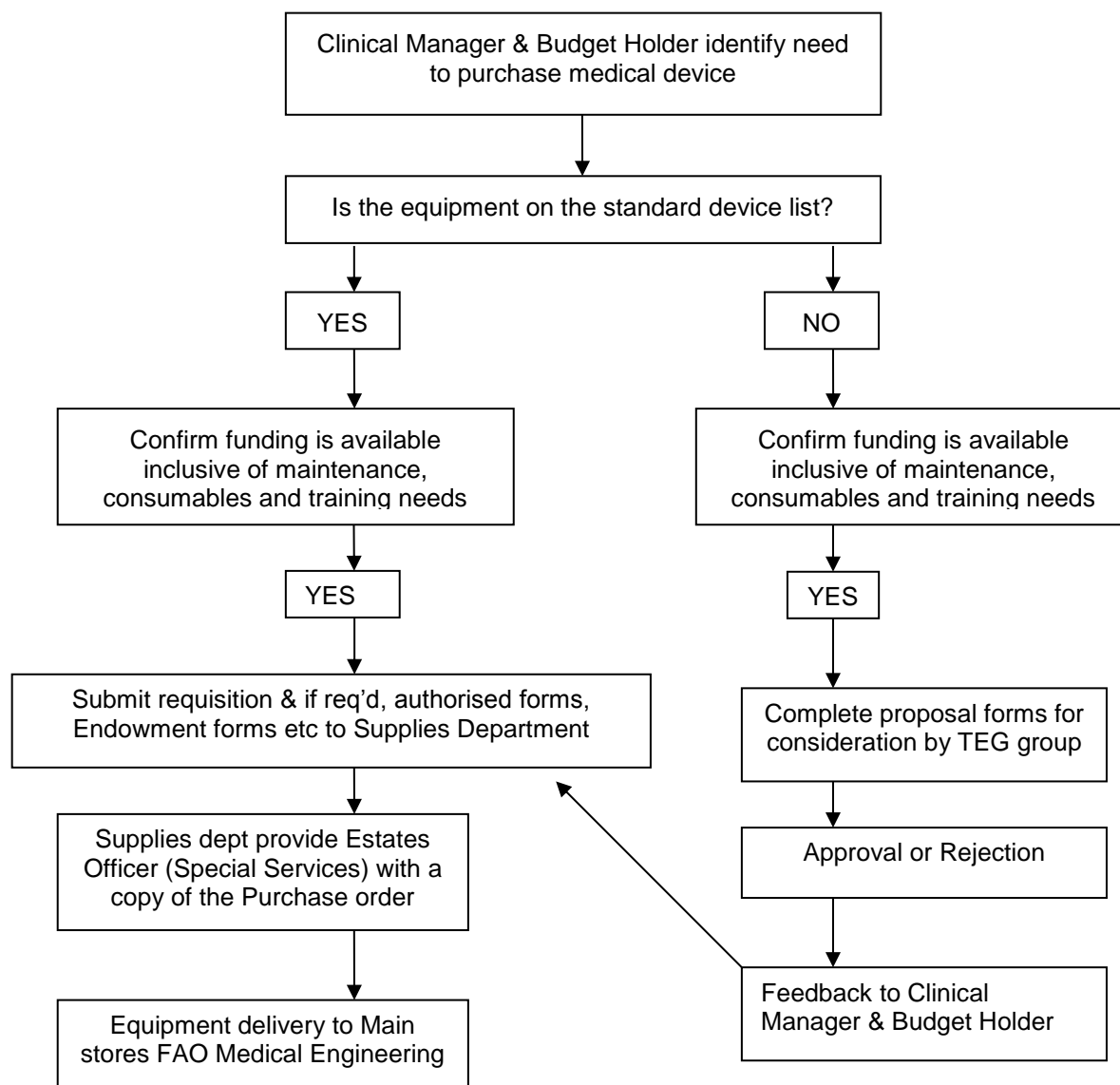
Standard medical devices

Standard devices have been approved by the Trust and can be ordered via the Supplies Department using the normal purchasing procedure.

Non-Standard Medical Devices

Non-Standard devices must have documented evidence to demonstrate the requirement for need within the Trust. Purchase will be dependent on the approval from Trust Equipment Group (TEG).

Purchase of Medical Equipment - procedure



Purchase of Medical Equipment Proposal Form

| | |
|--|--|
| Date | |
| Description of Medical device (inc. Make and Model) | Disposable fibre optic intubating laryngoscope. aScope monitor, aScope 2, aScope, trainer model |
| Function (Purpose of Medical Device) | Perform intubations and percutaneous tracheostomies fibre-optically. Particularly in emergency situations. |
| What device is in current use performing the same function | Re-useable intubating laryngoscope based in theatre. |
| Implications for not purchasing Medical Device | Risk of 1. Not being able to intubate patient in emergency situation. 2. Damage to multiple-use endoscopes during percutaneous tracheostomy insertion. |
| Evidence Base for the clinical function | NAP4 recommendations from Royal College of Anaesthetists. |
| Reason for purchase- See below | |
| New Equipment | New equipment |
| Condemned Equipment | |
| Beyond economical repair | |
| Planned Replacement | |
| Other (please specify) | |
| Source Of Funding | Critical Care patient fund |
| Purchase cost inc vat | £999 |
| Recurring Costs- see below | |
| Maintenance | |
| Consumables | Additional endoscopes - £200 each |
| Decontamination | Disposable |
| Standardisation and compatibility: Is the device compatible with other equipment | Similar endoscopes are being purchased for main theatre and A&E and DSU |
| Training Requirements: Cost/Frequency and Type | Training delivered by company. |
| Other specialist staff involved in selection of this device | Anaesthetic team |
| Additional Information to support this proposal | Essential requirement of NAP4 recommendations. There are also significant risks associated with the use and cleaning on the existing endoscopes |

| | |
|--|--|
| Clinical Manager leading this proposal | |
| Budget holder | |

Please email this completed form to xxx and copy in your Senior Manager. Your proposal will be discussed at the next Equipment Group Meeting (TEG). If required you may be invited to attend the meeting.

Appendix 2 – Example of a simple business case

Simple business case template for the purchase of the disposable intubation Ambu aScope2

Summary

This document aims to outline the need for [***] disposable intubation endoscopes per year, for use in the emergency management of the patient with a difficult airway or displaced tracheostomy tube. The endoscopes will be located and used within the operating theatre and [Insert locations where Ambu aScope2 will be used] at the Trust.

During emergency management of the difficult airway, the anaesthetist needs an intubation endoscope which is reliable, quick to set-up and portable so it can be easily transported to the point where it is needed.

The Ambu aScope2 has been identified as a product that meets these requirements.

Background

The Trust undertakes an average of [***] general anaesthetics per year. Of these, approximately [***] require endotracheal intubation. Although the vast majority of these are performed without problems, difficulties with tracheal intubation occur in approximately [***] case per year.

The Trust also undertake [***] tracheostomies per year within ICU.

The management of unexpected difficult airways and displaced tracheostomy tubes requires the use of a fibre optic intubating endoscope.

Currently the Trust has [***] multiple-use endoscopes which are stored in [***]. However there are circumstances during which these endoscopes become unavailable for use.

1. During sterilisation of multiple-use endoscopes which is required after every use and every 72 hours when not used. This is carried out centrally and removes the endoscope from use for [***] hours.
2. When use of an endoscope is needed out of routine working hours, such as during the night or when the processing unit is closed, this may result in the equipment being removed from service for up to [***].
3. When multiple use endoscopes are undergoing regular routine maintenance or on occasion are being repaired.
4. Fibre optic endoscopes are routinely stored some distance from where they are needed in an emergency e.g. in a different department or building. In this situation, and at the time of trying to manage an unexpectedly difficult airway, the equipment is therefore effectively rendered as 'unavailable' for use.

The availability of a stock of disposable video endoscopes will dramatically reduce the clinical impact of the above issues and ensure patients get the most appropriate and timely care.

The proposed disposable Ambu aScope2 will not replace the existing multiple-use fibre optic endoscope which will continue to be used with elective theatre cases. The Ambu aScope2 will be for emergency cases only.

As the use of the disposable endoscope is solely for emergencies, this will also reduce the wear and tear and risk of damage to the existing multiple-use endoscope stock.

All junior and senior anaesthetic staff will be trained to familiarise them with the new disposable intubation video scope. Short training sessions will be supplied free of charge by the manufacturer.

Key benefits

- Improved care of people with unexpected difficult airways.
- Avoidance of rare negative outcomes – rare but catastrophic negative outcomes such as brain damage and death can be avoided.
- Reduced adverse events resulting from unavailable equipment
- Improved ability to meet the challenges of airway management in locations which are remote from storage points.
- Reduced wear and tear and damage to existing multiple-use fibre optic endoscopes.
- Potential for litigation reduction.
- Reduced likelihood of re-scheduling of surgery – if an endoscope is available when required this may prevent patients with difficult airways needing their surgery to be re-scheduled.
- Reduced demand on multiple-use endoscopes.
- Endoscopes are packaged sterile and are single patient use so do not need to be disinfected prior to or following use.
- No maintenance – endoscopes are disposable are therefore do not need to be maintained.
- No repairs required – if an endoscope is damaged during use this has no major clinical or financial impact.

Finance

From our estimate of emergency airway cases, there is a requirement for [***] Ambu aScope2s per year. The aScope monitor will be provided free of charge with the initial purchase of 5 endoscopes.

The cost of each disposable endoscope is £[***]

Unit purchase: £[***] inclusive of VAT

Total cost per year £[***] x [***] = £[***]

[The following potential savings may be calculated locally to help inform the business case.]

The potential savings are:

- Avoidance of rare negative clinical outcomes
- Avoiding delayed or re-scheduled surgery
- Reducing demand on multiple use endoscopes
- Reduced endoscope cleaning costs
- Reduced risk of damage to multiple-use endoscopes
- Reduced cost of litigation

Recommendation

It is recommended that the Trust sanction the purchase of [***] disposable aScope2. This will improve safety for patients and help to achieve better outcomes for patients with acutely compromised airways.

Signed

[***]

Glossary

Awake fibre optic intubation

An anaesthetic technique used to manage patients with known difficult airways.

Endotracheal tube

A catheter inserted into the trachea through the mouth or nose that maintains an open airway through which to deliver oxygen and anaesthetic gasses. The ET tube also allows suctioning of mucus from the airways and prevents aspiration of stomach contents into the lungs.

Endotracheal intubation

The insertion of an endotracheal tube.

Fibre optic endoscope

An instrument that utilises fibre optic technology for the visual examination of a body canal or cavity.

Hypoxia

A deficiency in the amount of oxygen delivered to the tissues or vital organs.

Intubating laryngeal mask

A type of laryngeal mask that can facilitate endotracheal intubation.

Laryngeal mask

A tubular airway with an inflatable rim which creates an airtight seal immediately above the larynx.

Supraglottic airway device

An airway device such as a laryngeal mask that sits above the glottis.

Tracheostomy

The creation of an opening into the trachea through the neck.

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