Clinical practice review

Difficult Airway Management in the Intensive Care Unit: Practical Guidelines

M. S. T. LIM, J. J. HUNT-SMITH
Intensive Care Centre, St Vincent's Hospital, Melbourne, VICTORIA

ABSTRACT

Objective: *To review the management of the difficult airway in the intensive care unit patient.*

Data sources: *A review of publications reported from 1975-2002 and identified in both the Medline and Pubmed databases on the management of the difficult airway. The publications were also assessed for their relevance to the intensive care setting.*

Summary of review: *Endotracheal intubation is performed infrequently in the intensive care unit and usually in patients who have a higher than average rate of difficulty. The consequences of inadequate airway management can be devastating not only for the patient, but psychologically for the staff involved in whom airway management should be a core skill. Most of the reports reviewing the management of patients with a difficult airway are found in the field of anaesthesia and to a lesser extent in the field of emergency medicine. This review looks at the application of all the reported literature for difficult airway management in the intensive care setting. We propose guidelines that may assist both the trainee in intensive care medicine and the experienced intensivist in the management of the airway in the intensive care patient.*

Conclusions: *The principles of difficult airway management, including a back-up plan and calling for assistance early, hold true in the intensive care setting as much as in any other clinical setting. It is vital that clinicians develop their own difficult airway algorithm based on their training and experience.* (**Critical Care and Resuscitation 2003; 5: 43-52**)

Key words: Laryngoscopy, local anaesthesia, airway, management: airway, tracheal intubation: awake, direct vision, fibreoptic

Airway management is an obligatory skill for all critical care practitioners. Failure to maintain an airway and oxygenate a patient adequately may not only result in an increase in patient morbidity and mortality but also be psychologically distressing to the care-givers involved, who often feel that they have failed in the most basic aspect of patient care.

Fortunately, failure to maintain an airway and oxygenate a patient due to a difficult airway in the intensive care unit (ICU) is rare; but that it is rare renders the situation difficult to adequately prepare and train for.

Most publications on difficult airway management have been in the context of anaesthesia and, to a lesser extent, emergency medicine. However, the nature of the patients and their underlying disease in the ICU mean that there are specific airway problems that the intensivist encounters that are different to those found in the operating theatre or the emergency department.

We review the incidence of difficult intubation, its predisposing factors and its assessment, discuss some of the practical considerations for difficult airway management and training in the ICU patient and present some clinical scenarios.

Correspondence to: Dr. M. Lim, Intensive Care Centre, St Vincent's Hospital, Fitzroy, Victoria 3065
(e-mail: michael.lim@talk21.com)

Definitions

In 1993, the American society of anesthesiologists (ASA) published guidelines on management of the difficult airway,[1] which included the following definitions:

Difficult airway. The situation in which a conventionally trained anaesthetist experiences difficulty with tracheal intubation, difficulty with mask ventilation or both.

Difficult mask ventilation. When the unassisted anaesthetist cannot maintain the arterial oxygen saturation above 90% by mask ventilation using 100% oxygen and positive pressure mask ventilation (provided it was above 90% prior to induction) or cannot reverse signs of inadequate ventilation (e.g. absence of exhaled CO_2, chest movement and spirometic measures of exhaled gas flow or presence of cyanosis, tachycardia and hypertension).

Difficult laryngoscopy. When it is not possible to visualise any portion of the vocal cords with conventional laryngoscopy.

Difficult endotracheal intubation. When insertion of an endotracheal tube takes more than 3 attempts or longer than 10 minutes to perform using conventional equipment.

Incidence

In the operating theatre, Rose and Cohen[2] reviewed 18 500 general anaesthesia cases where direct laryngoscopy was performed. Endotracheal intubation was uncomplicated in 94% of cases, 2.5% required more than 2 attempts, 1.8% were described as "difficult" (using a different definition to the ASA, where a competent anaesthetist was unable to intubate the trachea on 2 attempts) and in 0.3% it was deemed prudent to stop persisting. In a further 353 cases (1.9%) an alternative method of intubation was used. However, the increasing use of alternative airway devices and even other anaesthetic techniques (e.g. a regional block in an awake patient with a suspected difficult airway), means that an undetermined high-risk subpopulation may be excluded from some surveys.

In the emergency department, there is a much higher incidence of difficult intubation (e.g. 3 - 5.3%),[3,4] with two studies reporting the rate of failed intubation leading to cricothyroidotomy more than doubling (e.g. 0.5 - 1.1%) over a two year period.[3,4]

The difference between anaesthetic and emergency department data probably relate to the latter having patients in whom airway problems present as an emergency where the consequent lack of time for pre-intubation assessment and preparation and the severity of the patient's medical condition complicate the case. Primary indications for intubation in 417 patients in one North American emergency department (ED) were: mechanical ventilation 57.4%, airway protection 41.3%, and cardiac arrest 1.3%.[4]

We could find no published statistics for the incidence of a difficult airway in the ICU setting.

Grading the 'difficult laryngoscopy'

Cormack and Lehane graded intubation difficulty by assessing the view of the glottis obtained at laryngoscopy (figure 1).[5]

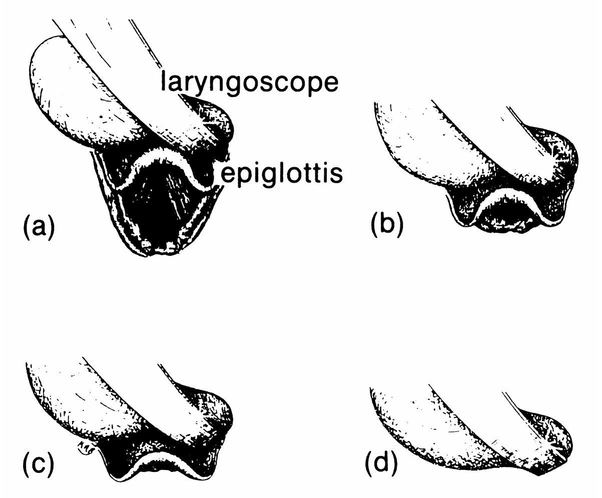

Figure 1. Grades of difficulty from the best obtainable views at laryngoscopy. (a) Grade 1 - no difficulty, (b) Grade 2 - only posterior extremity of the glottis visable, Grade 3 - epiglotis only seen, Grade 4 - epiglotis not seen (Modified from Cormack RS, Lehane J. Anaesthesia 1984;39:1105-1111)

Although the original classification referred to obstetric intubations, their classification is now used widely for non obstetric intubations. The grading from 1 to 4 is defined as:

Grade 1. Most of the glottis is seen and there is no difficulty with intubation,

Grade 2. Only the posterior extremity of the glottis is visible and there may be slight difficulty with intubation. Pressure on neck may improve the view of the larynx,

Grade 3. The epiglottis can be seen but no part of the glottis is visible. There may be severe difficulty with intubation, and

Grade 4. Not even the epiglottis can be seen. Intubation is impossible without special techniques. This situation is rare if the anatomy is normal.

Predisposing factors

In the first 2000 incidents in patients undergoing an anaesthetic intervention reported by the Australian incident monitoring study (AIMS), the following factors were identified as significant factors predisposing to difficult intubation.[6]

Operator related factors. One third of difficult anaesthetic intubations involved an initially unassisted trainee. One fifth occurred outside normal working hours (i.e. when senior or more specialised help was less readily available).

Disease related factors. One third of difficult intubations were emergency cases.

Patient related factors. While a receding jaw, prominent frontal incisors, small mouth, high arched palate, short thick neck, large tongue tonsils or other throat mass and reduced mobility of the mandible or cervical spine are the characteristic patient related factors associated with a difficult intubation, obesity, limited neck mobility and limited mouth opening were factors in two-thirds of difficult intubations in the AIMS study. The anatomy of a difficult intubation is highlighted in figure 2.

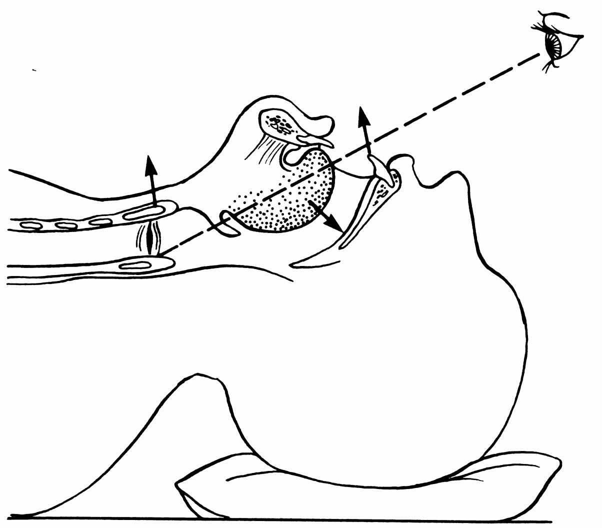

Figure 2. A difficult intubation may be encountered if the glottis, tongue and teeth are moved in the direction of the arrows (Modified from Cormack RS, Lehane J. Anaesthesia 1984;39:1105-1111).

In the intensive care unit, these predisposing factors are often exacerbated. For example, operator related factors (e.g. many intubations may occur outside normal working hours and may therefore performed by junior trainees without more specialised help), disease related factors (e.g virtually all intubations will be emergencies) and patient related factors (e.g. in addition to the curtailed preparation time associated with emergency cases, the stress due to the patient's deteriorating condition contributes to the difficulty with airway management. Whilst a recent previous intubation may give valuable information about any potential problems, it may also predispose to airway oedema, sub-glottic inflammation and even stenosis).

Assessment

In the operating room, the AIMS data suggested that there was a lack of reliable preoperative assessment techniques and the skills for the prediction of difficult intubation, such that pre-anaesthetic assessment failed to predict one third of difficult intubations.[6]

In the emergency department, due to the emergency presentation of the patient and the urgent requirement for intubation, assessment of the patient's airway is often cursory and incomplete. Although the ICU and emergency departments have patients with a similar need for urgent intubation, in the ICU patient the clinician is usually aware of the possibility of a difficult airway before the patient requires intubation.

In the instance where a pre-intubation assessment is possible, then the principles of history (table 1) and clinical examination (table 2), which should be followed by special predictive tests (table 3), usually apply. It is essential to determine from the clinical findings whether there will be problems:

1. at the time of administration of anaesthetic agents (most importantly when the loss of airway muscle tone might cause complete airway obstruction),
2. with facemask inflation,
3. when attempting laryngoscopy, and
4. when intubating. One then has to make rational primary and backup plans for airway management.

Table 1. History for airway assessment

	Potential Problems
Anaesthesia records	All stages
Previous intubation trauma	All stages
Previous surgery, radio-therapy to head/neck	All stages
Airway disease process	All stages
Systemic disease e.g. rheumatoid arthritis, ankylosing spondylitis	Difficult laryngoscopy
Sleep apnoea	Loss of airway tone and difficult laryngoscopy
Previous tracheostomy	Difficult laryngoscopy and intubation
Gastro-oesophageal reflux	Aspiration of gastric contents
Full stomach	Aspiration of gastric contents

Predictive tests

Several tests have been used to try and more accurately predict difficult direct laryngoscopy. The most commonly described tests are the Mallampati test, the 'jaw slide', the thyromental distance and Wilson's score.

Table 2. Examination for airway assessment

	Potential Problems
Stridor	All stages
Obesity	Loss of airway tone and difficult laryngoscopy
Short neck	Difficult laryngoscopy
Reduced mouth opening	Difficult laryngoscopy
Receding jaw	Difficult laryngoscopy
Hamster mouth	Difficult laryngoscopy
Buck teeth	Difficult laryngoscopy
Missing upper teeth	Difficult laryngoscopy
Respiratory difficulty	Difficult laryngoscopy
Neck masses	All stages
Position of larynx/ trachea and availability of cricothryroid membrane	Difficult laryngoscopy and intubation

Mallampati test

Mallampati *et* al,[7] described a predictive assessment made with the patient sitting opposite the assessor at eye level. The patient is asked to open their mouth and protrude their tongue as much as possible.

The extent to which the structures are visible leads to a predictive classification with class 1 predicting the easiest and class 3 predicting the most difficult laryngoscopy (table 3). Samsoon and Young,[8] later added Class 4 in which only the hard palate is seen (figure 3).

Table 3. Mallampati classification

Class 1	Soft palate, faucial pillars and uvula are all visible
Class 2	Soft palate and faucial pillars are visible But uvula obscured by the base of the tongue
Class 3	Only soft palate visible

Jaw Slide

This test is performed to assess the maneuverability of the mandible by the laryngoscope. The patient is asked to slide his mandible forward as far as possible with respect to the maxilla. The lower the grade, the easier the laryngoscopy.

Table 4. The Jaw slide test

Grade A	Lower teeth in front of upper teeth
Grade B	Lower teeth equal to upper teeth
Grade C	Lower teeth behind upper teeth

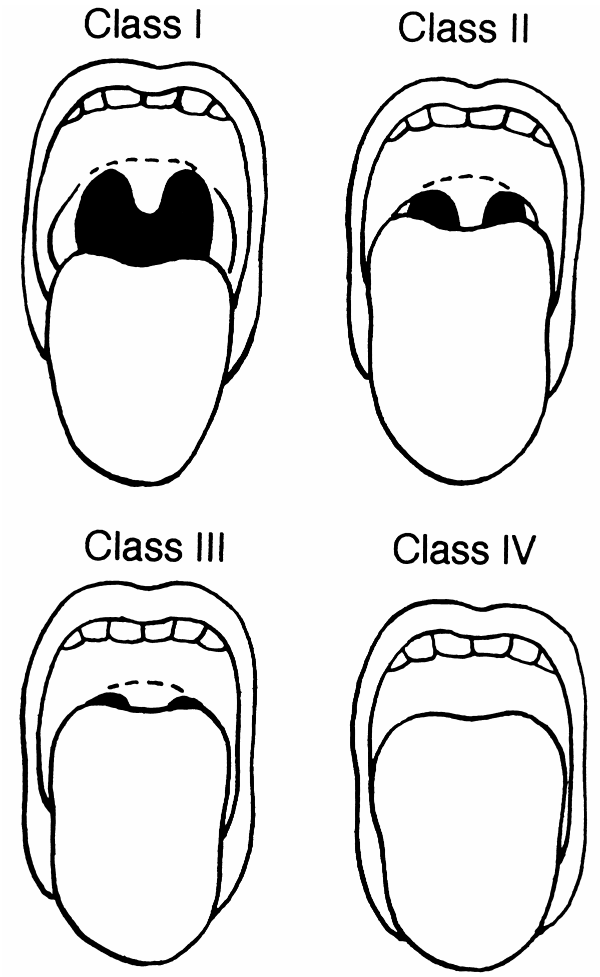

Figure 3. Pictorial representation of Mallampati scores. Class I: faucial pillars, soft palate and uvula visible. Class II: soft palate and uvula visable. Class III: soft palate visible. Class VI: none of the landmarks are visible. (Modified from Samsoon GTL, Young JRB. Anaesthesia 1987;42:487-490).

Thyromental distance

This was used by Patil to predict the ease of intubation.[9] As the name suggests, it measures the distance between the mental process and the thyroid cartilage with the neck in full extension. If the distance was less than 6.5cm or, more crudely, less than three fingers then a difficult intubation was predicted.

Wilson's score

In an effort to combine the best of the varying clinical features, scoring systems have been produced to predict the ease of intubation. One example is Wilson's score (table 5).[10]

Table 5. Wilson's score

Clinical feature	*Score*
Weight	
< 90kg	0
90 - 110kg	1
> 110kg	2
Receding mandible	
Normal	0
Moderate	1
Severe	2
Jaw movement	
Interincisor Gap ≥ 5 and Subluxation > 0	0
Interincisor Gap < 5 and Subluxation = 0	1
Interincisor Gap < 5 and Subluxation < 0	2
Head and neck movement	
> 90°	0
'About 90°'± 10°	1
< 90°	2
Buck teeth	
Normal	0
Moderate	1
Severe	2

(Subluxation = protrusion of lower jaw above upper teeth)

Table 6. Application of Wilson's score

Risk sum criterion	True positive (%)	False positive (%)
≥ 6	8	0
≥ 5	17	0.3
≥ 4	42	0.8
≥ 3	50	4.6
≥ 2	75	12.1
≥ 1	92	26.2

A threshold is chosen above which a 'difficult airway' strategy will be instituted (table 6). For example, when a risk sum criterion ≥ 2 is used, 75% of the 'difficult' laryngoscopies will be identified at a cost of falsely identifying 12% of the 'not difficult' patients. By using more stringent criteria (risk sum ≥ 5) only 0.3% of normal patients will be wrongly labeled as difficult, but only 17% of genuinely difficult intubations will be identified.

Wilson's score illustrates characteristics common to all predictive tests, that they share a high sensitivity, but a low specificity and positive predictive value. Moreover, most tests show only moderate inter-observer reliability.[11] These investigations are often time-consuming and when the situation is acute there is usually little time available. Many of these tests also require a fully co-operative patient.

Investigations

While the ASA guidelines group did not find a scientific basis for using specific screening tools in the evaluation of the difficult airway, additional evaluation may help to characterise the likelihood or nature of the anticipated airway difficulty. The two most commonly used investigations are 'thoracic inlet' radiographic views for a patient suspected of retrosternal extension of a neck mass (classically a thyroid goitre) and lateral cervical X-rays in patients with neck trauma or rheumatoid arthritis (a gap of more than 3 mm between the odontoid peg and the posterior arch of the axis being diagnostic of cervical subluxation). However, given the adverse consequences of a false negative test, this often means that regardless of the result, a contingency plan for the management of a difficult airway has to be considered in these patients, given that the index of suspicion is high enough to warrant the investigation.

White and Kander,[12] retrospectively compared radiological measurements in those patients who had proved to be a difficult intubation with normal intubations. The following were found to be useful predictors:

1. Ratio of mandibular length to posterior depth > 3.6. Where the mandibular length is measured from the tip of the lower incisor to the posterior limit of the bone at its articulation with the temple, and the posterior depth is the length of a perpendicular from the alveolar margin of the last molar tooth to the lower border of the mandible.
2. Increased anterior depth of the mandible (measured as a perpendicular line from the tip of the most anterior incisor).
3. A reduced distance between the spinous process of the first cervical vertebra and the occiput (i.e. the atlanto-occipital distance). This is a measure of the ability to extend the head during laryngoscopy.

Nevertheless, despite each test having its advocate, currently no clinical test predicts reliably the possibility of a difficuly intubation and therefore it is essential that all intensivists be trained and equiped to deal with the situation of an unexpected failure to intubate.[13] A prudent approach in the critically ill patient would be to perform a quick examination of the airway, in particular trying to establish any contra-indications to the proposed primary method of securing the airway and establishing backup plans before proceeding. Ultimately all airways should be considered to be 'difficult' so a back-up plan must be previously thought of and immediately able to be carried out.

Management

Although the ASA practice guidelines[1] for "best practice" was not intended as an absolute requirement, following its publication a 30 - 40% reduction in respiratory related malpractice cases, brain damage and death in anaesthetic practice was reported.[14] With the introduction of the laryngeal mask airway (LMA) in the management of the difficult airway, the ASA guidelines have been reviewed by one of the original authors,[15] and now stress the following:

- an awake intubation should be considered if difficulty with the airway is recognised,
- after induction of general anaesthesia the patient should be reawakened whenever serious difficulty is encountered (rarely feasible in the ICU situation),
- always have alternate plans in place (i.e. consider "plan B" in the event that "plan A" appears to be failing), and
- many techniques can be used based on the training, knowledge and experience of the practitioner (of critical importance in the ICU setting).

The guidelines also recommend that the physician should carefully consider, 1) pre-procedure preparation and 2) intubation strategy.

Pre-procedure preparation

The literature has not rigorously addressed the effects of patient and equipment preparation on outcome. However, there is a belief that preparatory efforts enhance success and minimise risk. These efforts ideally consist of:

- Informing the patient of the risks and procedures (if time allows) to improve patient co-operation.
- Using an assistant and ascertaining that there is at least one other clinician available for further assistance.
- Planning how to keep the patient oxygenated during the procedure.
- Having a 'difficult intubation' trolley at hand.

Intubation strategy

The physician must have a pre-formulated strategy for both the expected and unexpected difficult airway. The plans must take into account the pre-procedure evaluation, risk of aspiration and the physician's experience. An uncooperative patient may restrict the options for management of the difficult airway, particularly those that involve an awake intubation. If a difficult airway is encountered after a patient is anaesthetised, the following questions have to be considered:

- is the situation a difficult intubation or difficult mask ventilation or both?
- do I have to proceed (risking cardiac arrest or ventilatory failure) or do I get help? Should I try another approach or cease anaesthesia and review the best solution without putting the patient at risk?

The physician should have the answers to these questions before attempting intubation as they are the major factors in the choice of the back-up plan (i.e. "plan B").

Difficult direct laryngoscopy

If a difficult laryngoscopic view is found after the patient is anaesthetised (i.e. Cormack and Lehane Grade III or IV), then it is reasonable to have one further "best" attempt at laryngoscopy which should consist of the following components:

- an attempt by an experienced laryngoscopist,
- an optimal patient head and neck position (e.g. "sniffing-the-morning-air" or "sipping a full pint of beer"[16]),
- external laryngeal manipulation,
- consider adjuncts to laryngoscopy,
- consider a *single* change of laryngoscope blade size and type,
- consider using a smaller sized endotracheal tube.

External laryngeal manipulation

Optimal external laryngeal manipulation involves pressing on the larynx posteriorly and cephelad,[17] whilst the BURP manouevre involves a Backwards, Upwards, and Rightwards Pressure to displace the larynx onto the cervical vertebrae.[18] These manoeuvres should improve the laryngoscopic view by one grade. Therefore, the techniques should be of most value when confronted by a grade III view, which could potentially be improved to a grade II view. However, while cricoid pressure may improve a laryngoscopic view in many instances, it may impair the view (and even the passage of the endotracheal tube through the glottis) in some cases. Therefore, consideration should be given to attempt intubation during the temporary release of cricoid pressure.

Adjuncts to laryngoscopy

These include an aluminum stylet which can preform the endotracheal tube into a curve that will allow it to pass behind the epiglottis in the event of an anterior larynx. If the stylet is hollow capnography can be used to show the characteristic pattern associated with breathing when it is correctly inserted into the trachea. Similarly, a gum-elastic bougie will provide an ability to lift the epiglottis, to allow passage of the bougie, followed by the endotracheal tube into the trachea.

Alternate laryngoscope blades

In addition to a standard longer blade, several other blades have been developed. Most have been designed to see further "round-the-bend" and therefore are primarily of value when the larynx appears anteriorly on the initial laryngoscopy. The McCoy levering laryngoscope[19] is designed to pass posterior to the epiglottis, rather than into the vallecula and has a lever incorporated into the laryngoscope handle which, when pressed, causes the tip of the laryngoscope blade to lift the epiglottis away form the laryngeal inlet. The Siker laryngoscope incorporates a mirror-like plate into its blade, which aims to reflect an anterior larynx into the line of vision. The Huffman modification of the standard MacIntosh blade uses a prism within the laryngoscope blade to view the larynx.

While these blades allow better visualisation of the larynx, the problem of trying to manoeuvre the endotracheal tube into the larynx remains, requiring the additional use of either a stylet or a gum-elastic bougie. In practice, these specialised blades are useful largely in the controlled environment of the operating room, and have a limited role in the critically ill patient except in the most experienced hands.

If an external structure obstructs the insertion of the laryngoscope handle (e.g. large breasts in a pregnant woman), then both short handles and polio blades (which are positioned at an obtuse angle to the handle) have been successfully used.

Awake intubation

The advantages and disadvantages as well as indications and contra-indications to an awake intubation compared with an intubation during general anaesthesia are summarised in tables 7 and 8.

In the Rose and Cohen study of 18 500 endotracheal intubations,[2] an awake fibreoptic intubation was the most commonly used alternative endotracheal intubation technique to the standard laryngoscopic intubation during anaesthesia and had a success rate of 98% with a low complication rate. Other methods to secure an airway without direct laryngoscopy are reviewed in a separate article.

Table 7. Advantages and disadvantages of an awake intubation

Advantages	*Disadvantages*
• Preservation of muscle tone maintains the patient's airway • The patient continues to breathe during the intubation • The patient is cooperative • The aspiration risk low • The muscle tone is preserved in patient with cervical spine injuries	• Patient discomfort • Reqiuires a co-operative patient (so unable to be performed in a head injured patient or in children)

Table 8. Indications and contraindications for an awake intubation

Indications	*Contraindications*
• When difficulty with face mask ventilation or endotracheal intubation is anticipated • When the time taken to intubate may exceed the time the patient can be safely apnoeic • With injury to cervical spine, upper airway or face	• Unconsenting or uncooperative patient • Local anaesthetic sensitivity

"Difficult airway" algorithm

Many 'difficult airway' algorithms have been published,[1,15,20] although they are usually devised for the surgical patient who is about to undergo general anaesthesia. All include decision pathways that involve waking the patient up as one alternative. However, in many instances in the intensive care unit the only strategy for adequate oxygenation will involve rapid access to the airway, therefore endotracheal intubation must be achieved as quickly as possible. Moreover, unlike the operating suite environment, cardio-respiratory reserves are often depleted prior to intubation in intensive care patients (demanding rapid restoration of adequate oxygenation), and trained assistance and specialised equipment are also often less readily available. Accordingly, in the ICU setting, emphasis should be placed on both readily availability of appropriate equipment and expert assistance.

Oxygenation should be maintained (e.g. facemask) until expert help arrives if clinicians with little or no anaesthetic experience are called upon to intubate a patient in an emergency (eg. cardiac arrest, accidental extubation) and a "cold" intubation cannot be achieved rapidly. While it would be feasible to attempt simple airway techniques (e.g. Guedel airway) to maintain the airway, repeated laryngoscopy is often harmful and ventilation (e.g. carbon dioxide excretion) and airway protection are usually of secondary importance. Our proposed algorithm is outlined in Figure 4.

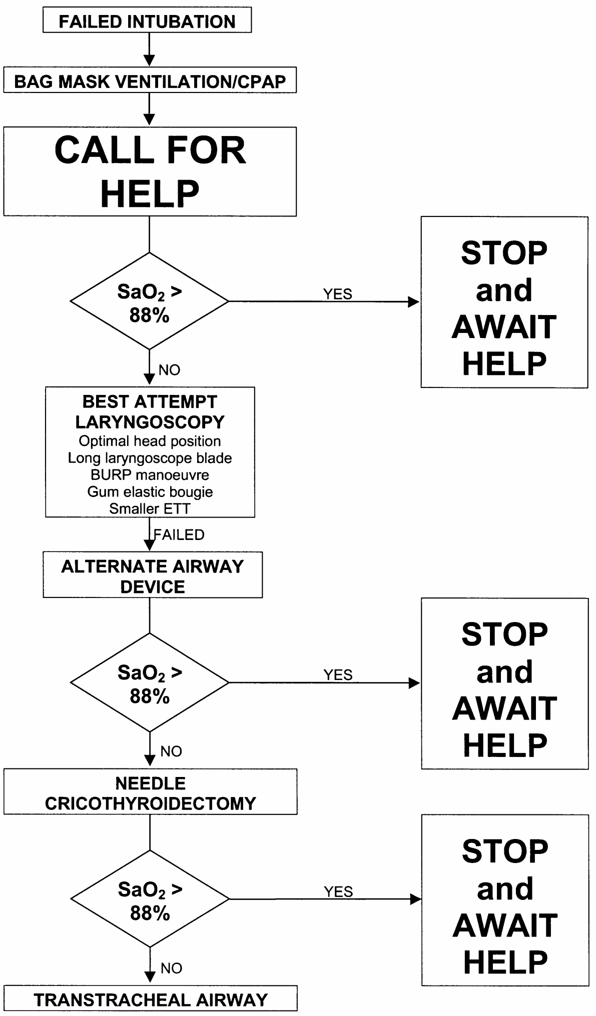

Figure 4. A decision pathway to guide a failed intubation for junior trainees.

If an experienced operator is unable to intubate the patient, sooner or later one will have to proceed to either an alternative airway technique or a tracheostomy. The most notable example is the cricothyroid airway, which is a useful way to administer oxygen whilst other time-consuming procedures to intubate the airway (e.g. tracheostomy) are attempted. The "call for help" has also been included in the experienced intensivist's algorithm as even the most experienced clinicians might need an extra pair of hands and/or surgical assistance. Our suggested algorithm is outlined in Figure 5.

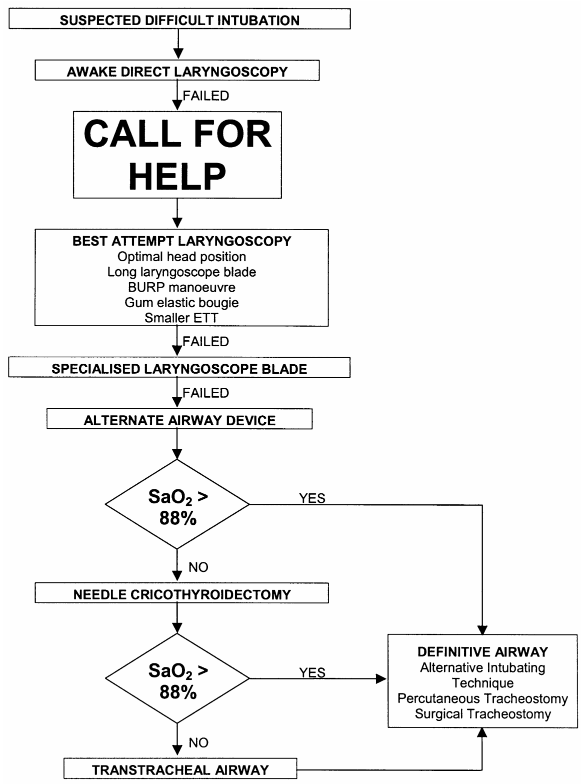

Figure 5. A decision pathway to guide a failed intubation for experienced intensivists.

While mannikins may be useful to introduce a large number of techniques in large group teaching, they fail to simulate many of the factors that contribute to a difficult intubation, such as the presence of secretions in the airway and variations in airway tone. More advanced simulators can re-create the urgency and the distraction of the patient becoming more unstable, in addition to adding certain difficulties e.g. laryngospasm and a swollen tongue, but are extremely expensive.

There are data suggesting that theoretical study will complement practical experience. Bishop *et al*,[21] studied the retention of an intubation skill in respiratory therapists one year after their training and found that the best performers also had the best scores on a written test. However, there can be no doubt that there is no substitute for hands-on experience. It is now universal for training boards for intensive care medicine to have obligatory anaesthetic rotations.

Whilst the emphasis is often on the abilities of the clinician who is attempting to secure the airway and oxygenate the patient, the role of the medical and nursing assistants are equally important. They will need to be familiar with the techniques and the equipment that the clinician will be attempting to use, and often will be required to assist with cricoid pressure, administering drugs and loading the endotracheal tube onto a stylet or gum-elastic bougie. Hence training should be extended to create a cohesive team.

Clinical scenarios

"Can't ventilate, can't intubate"

This problem is rare in general surgical patients undergoing an elective procedure. It is defined as a failure to intubate on a second 'best attempt' (by an experienced laryngoscopist, with optimal patient position, optimal external laryngeal manipulation and perhaps a single change of laryngoscope blade size and type) and failed best attempt at providing artificial ventilation (e.g. a two-person effort using appropriately sized oropharyngeal and nasopharyngeal airways).

The four acceptable responses to this situation are (in sequence):[15]

- insertion of a LMA (If ventilation via the LMA can be achieved, one may even proceed using the LMA as a conduit to intubation, eg. introducing the bronchoscope through LMA)
- insertion of a Combitube
- institution of transtracheal jet ventilation
- creation of a surgical airway.

Upper airway space occupying lesion

The three most common space occupying lesions causing upper airway obstruction are tumour (e.g. malignancy), pharyngeal haematoma and infection (e.g. retropharyngeal abscess, epiglottitis). Failure to secure the airway will usually result in complete airway obstruction, severe hypoxia and may even be fatal. When this situation is encountered, the following issues must be addressed:

- is the obstruction progressive? (i.e. how much time is there to prepare the intubating strategy and can I wait for other staff to arrive?)
- how likely is there to be a complete airway obstruction if the patient is anaesthetised and loses airway tone or will the patient have complete airway obstruction from laryngospasm if the airway is manipulated when he is awake?
- does the obstruction extend below the vocal cords? (i.e. will it be futile to intubate the cords if the ETT is still above the obstruction?)

Once intubation is attempted and fails, "plan B" would be a transtracheal airway in almost all instances. Therefore, it would be ideal to have the personnel with skills to secure a surgical airway present before any attempt at intubation. A blind technique is contra-indicated, as it would have a low probability of success and also have a high risk of causing trauma exacerbating the obstruction.

If it is decided that the intubation is best carried out with the patient anaesthetised, then, if possible, an inhalational induction should be used although, this will require an anaesthetic machine to be brought to the ICU. If there is a possibility that the obstruction continues below the vocal cords, then one should consider a transtracheal airway as a first-line strategy.

Conclusion

As the incidence of difficult intubation in the intensive care unit is low, this results in low levels of experience by both the intensive care clinicians who are required to maintain an adequate airway and oxygenation in the critically ill patient and intensive care nurses, who are required to provide vital assistance to the clinician. The complexity of the published algorithms and the varying array of techniques and equipment available for a wide range of scenarios, can be confusing and may bewilder the medical staff in an emergency, where clarity of thought and decisive action are essential. As there are no conclusive data demonstrating benefit for any of these techniques, it is often better for the clinician to use a supposedly less successful technique with which he or she is familiar than to try an allegedly better technique for the first time in an emergency situation.

Optimal management of the airway requires insight into the disease processes which are present as well as an understanding of the implications of therapeutic interventions. Strategies that can be put in place to reduce the risks of difficult intubation include a pre-prepared back-up plans (i.e. "plan B"), a better understanding of the advantages and disadvantages of the various techniques, ready access to alternate techniques using a "difficult airway" trolley and using awake intubation techniques wherever possible when a difficult intubation is likely. Ultimately, all intensivists must prepare their own personal algorithm, based on their training, experience and preferences.

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