

Peer Review File

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Review Comments

Reviewer A

Comment 1

I would like to thank the authors for their work. The purpose of this narrative review is clearly stated.

I would like to add just two suggestions.

1. The search strategy should be more complete.

Reply 1

The search strategy was reviewed and presented in a more thorough fashion.

Comment 2. ECMO cannot currently be considered a rescue technique for a CICO situation, since it is a technique that is highly dependent on time and preparation.

Reply 2-ECMO was removed from the paper. Although ECMO may be used in preparation of a difficult airway, such as an anterior mediastinal mass, not all institutions have the capability for this , thus it was removed from the paper.

Reviewer B

Comment 1

This is such a broad topic that the authors are to be congratulated for tackling it.

However in its breadth may be its weakness and I would encourage the authors to consider their structure

The abstract identifies four key components of the review

- i) Identification of the difficult airway
- ii) Management of the difficult airway
- iii) Management of the failed airway
- iv) A Focus on the updated 2022 ASA Guidelines

Reply 1

The paper was an invited paper to review the difficult airway and to include some of the newer guidelines, particularly the new ASA guidelines. With that the authors structured the paper to be a broad and thorough review of the difficult airway and its management for the general audience.

Comment 2

Minor comments on the abstract

Methods talks about 5 years – your table in the methods discusses 20 years

Reply 2

The search strategy was reviewed and presented in a more thorough fashion. The error of “ 5 years” was removed from the paper.

Comment 3

You use the term and the search term (awake) fiber optic intubation yet the ASA 2022 guidelines discuss flexible bronchoscopic intubation and flexible intubation scopes- do you think these words should have been part of your search given your pre-stated desire to focus on the updated 2022 guidelines – I know you make some explanation of this later in the text but this is an important omission given your defined narrative review.

Reply 3

Flexible bronchoscope intubation was part of the search and that amendment has been made.

Comment 4

On reading the article I can identify the following areas

- Identifying and recognizing the difficult airway
- Anticipated difficult airway management and awake fiber optic intubation (several pages)
- Unanticipated and Emergency Difficult airway Management- rapidly discussing CICO
– The ASA guideline references the phrase emergency invasive airway
- Extubation of the difficult airway

Reply 4

Those indeed were our focus areas to deliver a general broad scoped review of the identification and management of the difficult airway.

Comment 5

I also noted to excellent paragraphs towards the end of your submission

One P32 L5ff is an excellent example of how the pros and cons of a certain test or procedure can be examined by a narrative review- this model should be considered for other areas of the text where potentially conflicting points of view are discussed or theories examined.

Reply 5

This paragraph should remain where it is as it is relevant to the heading on other advanced techniques and the importance of the cuff leak test.

Comment 6

P33L4ff a note on the asa guidelines

This is a really useful paragraph and should feature much earlier in the review – this perhaps coupled with the proposed structure of your review might be a good starting point **after your introduction** as it makes the asa 2022 guidelines the focus

Reply 6

We moved this paragraph to the beginning of the paper right after introduction as suggested.

Comment 7

I also notice that your review is very short of tables and figures-

One could think of (but definitely not limited to)

- A picture of an airway cart
- A diagram of the C versus S shapes depending on where you stand for AFOI
- A box listing the equipment needed to perform an AFOI
- Images of different Emergency Invasive airway devices

Reply 7

Pictures of airway cart and several pieces of equipment needed for awake intubation added

Added Table: Equipment needed For AFOI

Table . Equipment Needed for Awake FOI

Flexible intubating bronchoscope

Suction tubing to be attached to suction port of scope
Antifogging agents
Lubricating agents
Oral airways (Williams, Berman, Ovasapian)
Nasal airways (if nasal intubation is to be performed)
Supplemental oxygen (nasal canula, facemask or high flow NC)
Endotracheal tube (Parker or standard)
Topical anesthetic administering devices (atomizing devices, nebulizer, mucosal atomization device)
Adjuncts such as cotton pledgets and cotton tipped swabs
Sedation medications (provider specific; goal of maintaining spontaneous ventilation)
Topical and/or airway nerve block anesthetic agents

Comment 8

Please consider whether an included **glossary** would help the reader understand the terms used- you define difficult airway in the introductory paragraph but do not define how many attempts at intubation can be considered a failure-the asa talk about 3+1 attempts- this could be an educational paragraph in its own right- what constitutes an attempt/ why limit the number of attempts/ what to do between attempts etc

Reply 8

Glossary has been added

This is defined in more detail in the Main Body Intro of the Recognition of the Difficult Airway. We discuss in more detail further in the article what constitutes attempt and what to do between attempts.

It would be distracting to present the definition in that much detail in the first line of the introduction of the article.

Added “There is no further definition of multiple attempts in the ASA guidelines, however, during difficult airway management, the guideline recommends limiting attempts with any technique class (i.e., face mask, supraglottic airway, tracheal tube) to three, with one additional attempt by a clinician with higher skills.”

Comment 9

As this is a narrative educational review in revising your manuscript please think “what do I want the reader to know and understand more clearly having read this section of our article”- this doesn’t have to be included in the article but it’s a helpful way of thinking how you might frame each section.

Reply 9

noted

Comment 10

Specific comments for consideration

P6L9 Please check your figures for saying that a large percentage of difficult airways are anticipated- Norskov suggested that 93% of difficult airways were unanticipated and of those that were anticipated only ¼ were actually difficult

Reply 10

Changed to

Although the difficult airway can be anticipated

Comment 11

P6L13 while the history of AFOI is interesting do you have space to include these details in your review?

Reply 11

Deleted the sentence about the history since we do not have more room to expand on it.

Comment 12

P6L15ff I see you only discuss American, Canadian and UK (albeit the 2004 version ,not the updated 2015 guidelines). Given the reach of JOMA should other airway management guidelines from around the world not be included here- AIDAA, PUMA, SAS S1, SAFAR, Italian etc etc

Reply 12

Added “In 20220, PUMA (Project for Univerals Management of Airways) worked with several international airway societies including *Difficult Airway Society, Society for Airway Management, European Airway Management Society, All India Difficult Airway Association, Canadian Airway Focus Group, Safe Airway Society, International Airway Management Society* to develop a consensus guideline for providing a foundation for airway management.”

Comment 13

P7L3 Reference 16- cook seems a little odd with the statement about CICO- I thought that the majority of airway guidelines prioritized oxygenation as the primary goad to facilitate onward decisions about airway management

Reply 13

These guidelines emphasize the importance of effective oxygenation as the primary goal of airway management and also provide the clinician with tools for decision making in managing the “cannot_intubate cannot ventilate/oxygenate situation”, (CI/CO), a scenario which is most often caused by poor evaluation and decision making in the pre anesthetic setting.

Comment 14

P7L11 Failed airway would b a good word in your glossary

Reply 14

Noted-thanks. Added failed airway to the key words at the beginning and to glossary

Comment 15

P7L18 We searched PubMed- you do not report how many results you retrieved or how you assessed them for inclusion- similarly it might be worth outwith the review looking at the difference in results if the aSA words- flexible bronchoscopic/ Emergency invasive airway etc are used.

Reply 15

Our search method has been revised and updated

Comment 16

P9L12 how many attempts? This is really important is it not?

Reply 16

Added “There is no further definition of multiple attempts in the ASA guidelines, however, during difficult airway management, the guideline recommends limiting attempts with any technique class (i.e., face mask, supraglottic airway, tracheal tube) to three, with one additional attempt by a clinician with higher skills.”

Comment 17

P9L5 it might be better to be clear and state that these definitions are taken from the ASA 2022 guideline at the top of the paragraph.- but also please consider discussing with the reader the potential pitfalls- how many SGA insertions? What might be the atypical anatomical features that would make it difficult to establish a surgical airway- could this go in a small table or text box?

Reply 17

Added - According to the 2022 American Society of Anesthesiologist Practice Guidelines for Management of Difficult Airways, the definition of difficult airways can be subdivided into several categories. Difficult facemask ventilation includes poor mask seal /excessive gas leak and/or excessive resistance to gas flow. Difficult

laryngoscopy is the inability to properly visualize any vocal cord structures despite multiple efforts. Difficult supraglottic airway (SGA) placement involves an inability to correctly position the SGA, placement requiring multiple attempts, poor SGA seal/excessive gas leak, or excessive resistance to gas flow. Difficult tracheal intubation is the inability to correctly place an endotracheal tube (ETT) despite multiple attempts. There is no further definition on multiple attempts. Difficult tracheal extubation is the management of extubation in an intubated patient who is known or suspected to have any variety of the definitions of the difficult airway. Difficult invasive airway involves difficulty or an inability to establish a surgical airway due to abnormal patient features such as atypical anatomic features (large goiters, previous neck radiation, anterior neck masses etc)

Comment 18

P10L1ff- this is an interesting paragraph but your challenge is to unlock it for the reader- which test is most effective/ which combination of tests/ what about scoring systems- Lemon, Macocha, etc

Reply 18: added

Overall, when all of the current literature is compiled, no single characteristic or group of characteristics was consistently most predictive for a difficult airway.

Comment 19

At least P10L12/13 deserves a reference if not a discussion on why the information is conflicting.

Reply 19

References are in place .

Comment 20

P10L17 could a table be used here to outline the difficulty expected with these various syndromes and diseases be included.

Reply 20

Table added

(reference: Hagberg and Benumof's Airway Management, fifth edition 2023, Chapter 9)

Patient history associated with a higher risk of difficult airways	Mechanisms of increased risk of difficult airways
History of a difficult airway	
Diabetes	Limited joint mobility 2/2 glycosylation of collagen. Delayed

	gastric emptying
Rheumatoid Arthritis	Hypermobility or immobility of the joints of the jaw, larynx, and neck 2/2 chronic autoimmune pathology
Ankylosing Spondylitis	Fusion and rigidity of spine, TMJ and cricoarytenoid joint 2/2 spondyloarthropathy
Temporomandibular Disorders	Mouth opening
Bleeding risk in the airway	Visualization of vocal cords, aspiration risk
Congenital Abnormalities (Treacher-Collins syndrome, Pierre Robin syndrome, Goldenhar syndrome, etc al.)	Craniofacial abnormalities
Masses of the Head, Neck, and Airway (with and without radiation)	Neck ROM, anatomical distortion
Burns	Inhalational injury
Acromegaly	Overgrowth of mucosa and the soft tissues of the pharynx, larynx, and vocal cords
Obesity	Multifactorial anatomical and physiologic changes related to adipose tissue deposition
Obstructive Sleep Apnea	Multifactorial

Pregnancy	Upper airway edema and aspiration risk
Aspiration Risk	
Psychosocial Context	

Comment 21

P10L20 this last sentence doesn't quite make sense and should be reworded.

Reply 21

Deleted the sentence since we add a table

Comment 22

P11L1ff in accepting the benefit of these investigations – what are the disadvantages of static versus dynamic testing- is there a role for these 3D recreations (for example)

Reply 22: ADDED

However difficulty may be underestimated in situations where the appearance of the lesion or anatomical variation in question varies with phases of the respiratory cycle for example.

COMMENT 23

P11L18 should the strategy also be based on the perceived difficulty or if the difficulty is unanticipated should it not be based on practice guidelines?

REPLY 23

Added "If a difficult airway is encountered unexpectedly, the ASA Practice Guidelines for Difficult Airway Management can be instrumental in formulating the strategies."

Comment 24

P12 L3ff you list many different devices- is it worth including some photographs- is it also worth including a paragraph on how individual airway managers should be trained in using the items available on their airway cart effectively- whatever those might be

Reply 24

Pictures added

Added "Training on use of the devices can be accomplished using mannequin, simulator or in the case of invasive from of neck assess, pig tracheas or 3d models.

Comment 25

P12L6 is it worth including some comments about how these skills might be obtained?

Reply 25

Added "Training on use of the devices can be accomplished using mannequin, simulator or in the case of invasive from of neck assess, pig tracheas or 3d models.

Comment 26

P12L15 (and the preceding paragraph)- is the nervous innervation of the airway really the most important first step in conducting an afoi- surely it is the decision to do an awake technique- as if the person is not skilled help can be sought- the paragraph on nervous innervation might be best replaced with a diagram

Similarly the important steps in the achievement of an effective awake technique could be described in a box or table.

Reply 26

Added - The most important first step in conducting an AFOI, is the ability to make the decision that an AFOI is indicated. Knowledge of innervation of the airway is essential

to successfully performing an AFOI.

We elected to keep the paragraph on nervous innervation and steps for awake intubation as a paragraph rather than inserting text boxes.

Comment 27

P14L15 here you use the term “flexible intubating bronchoscope” but this wasn’t one of your listed search terms on pages 7 or 8 – please be consistent

Reply 27

Flexible intubating bronchoscope is now a search term

Comment 28

P14L15 a reference for the “airway cart” would be useful- similarly a discussion of disposable versus reusable scopes could be considered if space allows

Reply 28

Added reference to the manuscript (Chapter 24, Hagberg and Benumof’s Airway

Management, 5th edition).

Added “In the authors’ institution, the reusable flexible intubation bronchoscopes had been replaced by disposable flexible intubation bronchoscopes, mainly due to the elimination of handling and sterilization of the delicate reusable ones. However, the environmental footprints of the disposable bronchoscopes are debatable, with the newer generations of disposable bronchoscopes having less CO2 emission. (Chapter 24, Hagberg and Benumof’s Airway Management, 5th edition)”

Comment 29

P15L1 60cm the cord of the intubating scope is 60 cm?

Reply 29

Added “Adult intubating bronchoscopes are up to 65 cm in length and have a diameter of either 3.8 mm, 5mm or 5.8 mm depending on which brand they are (.Hagberg and Benumof’s Airway Management, Chapter 24, 433-477)”

Comment 30

P15L2 the average being the smaller or the larger does not make sense

Reply 30

Deleted and reworded the sentence before.

Added “Adult intubating bronchoscopes are up to 65 cm in length and have a diameter of either 3.8 mm, 5mm or -5.8 mm depending on which brand they are (.Hagberg and Benumof’s Airway Management, Chapter 24, 433-477)”

Comment 31

P15L7 are there disadvantages to using an inappropriately sized bronchoscopic airway – this should be discussed

Reply 31

Added

In our routine practice, we prefer the largest size bronchoscope feasible to take advantage of superior visualization and stronger suction. A significantly narrowed airway warrants a smaller bronchoscope, at the expense of less optimized visualization and suction. Whenever possible, we recommend choosing the ETT most closely matching the bronchoscope, as the bigger the gap between the ETT and the bronchoscope, the more chance of the tube becoming “hung-up” at arytenoids during insertion.

Comment 32

P15L7 pictures of the various devices mentioned could be considered as one of the options

[Reply 32](#)

Pictures added

Comment 33

P15L12 supplemental oxygen should be highlighted as the first clinical step once the decisions around carrying out the procedure has been made

[Reply 33](#)

Added

Compared to the last edition, the new 2022 ASA practice guideline emphasized supplemental oxygen administration before initiating and throughout difficult airway

management, including the extubation process. Therefore, oxygen delivery devices such as nasal cannulae, specialized facemasks or high flow nasal oxygen (HFNO) should be readily available. The 2020 Difficulty Airway Society guidelines for awake tracheal intubation in adults recommended applying HFNO early and titrating the HFNO from 30-70 l.min⁻¹.

Comment 34

P15L18 should you mention the safe dose of lidocaine here??

Reply 34

Added

Lidocaine is perhaps the most commonly used local anesthetic used for topicalization of the airway. It has a rapid onset of action and a wide therapeutic index. Its duration of action is up to 1 hour with a peak at 15 minutes. It comes as a gel or liquid, both of which may be used on the airway, in concentration of 1%, 2% and 4%. The maximum dose allowable for topicalization is less well established. The British Thoracic Society recommend 8.2 mg/kg. Others recommend a lower limit of 4-5 mg/kg.[63-65] Our group uses the higher dose recommendations and we have not experienced any complications as a result of it.

Comment 35

P15 given your clear expertise in this field consider a text box outlining your topicalization technique?

Reply 35

Added box below

Non-invasive technique	Invasive technique
nebulizer	Superior laryngeal nerve block
atomizer	Glossopharyngeal nerve block
Spray-as-you-go	Transtreacheal blocok

Hagberg and Benumof's Airway Management, Chapter 24, 433-477

Comment 36

P16L2 is sedation required or is it optional?

Reply 36

Reworded in text.

Appropriate airway anesthesia and sedation decrease the patients anxiety and discomfort during AFOI

Comment 37

P16L2 the risks of over sedation in a patient with a potentially precarious or difficult airway should be clearly stated

Reply 37

Corrected in text

Sedation must be titrated carefully to maintain spontaneous ventilation. Note – increasing sedation cannot compensate for poor airway anesthesia. In these scenarios you simply have an uncomfortable patient that is no longer breathing.

Comment 38

P16L2 priority of inadvertently using sedation to overcome poor topicalization?

Reply 38

Corrected in text

Sedation must be titrated carefully to maintain spontaneous ventilation. Note – increasing sedation cannot compensate for poor airway anesthesia. In these scenarios you simply have an uncomfortable patient that is no longer breathing.

Comment 39

P16L8 what do you mean by a moderate level of sedation- should the patient have any monitoring attached before this is attempted?

Reply 39

Corrected in text

Judicious titration with meticulous monitoring for side effect is essential with the goal of maintaining a comfortable and cooperative patient.

Comment 40

P16L6 there are very few references in this paragraph which surprises me- please reference appropriately

Reply 40

References updated

Comment41

P16L11 low dose propofol has been regarded as controversial by some

Reply 41

Corrected in text to:

Infusions of carefully titrated propofol can be used for sedation, however, one has to consider the narrow therapeutic index for propofol when used for sedation, and the patient may become apneic without prior warning. Infusions drugs such as remifentanil or dexmedetomidine offer very fine levels of titration but do require more time to reach their steady state.

Comment 42

P17L7- should this sentence about the narrow therapeutic window for propofol go earlier- on the previous page??

Reply 42

Section has been rewritten and corrected

Infusions of carefully titrated propofol can be used for sedation, however, one has to consider the narrow therapeutic index for propofol when used for sedation, and the patient may become apneic without prior warning. Infusions drugs such as remifentanil or dexmedetomidine offer very fine levels of titration but do require more time to reach their steady state.

Comment 43

P18L3 this paragraph doesn't quite make sense –

i) There is a degree of repetition with the section on nervous innervation of the airway

ii) The authors spend 12 lines of text discussing nerve blocks before concluding that atomization is very efficient and efficacious – perhaps the orders of these two topics should be switched in the paragraph?

Reply 43

Section has been rewritten and corrected to below

One can anesthetize the upper airway by either performing airway nerve blocks or using topical anesthesia. Clinicians often worry that convincing a patient for the need for AFOI is difficult enough without the need to convince the patient they will have to tolerate a number of injections as well.

A number of blocks have been described. The glossopharyngeal nerve is anesthetized by injecting local anesthetic at the base of the tonsillar pillars. The superior laryngeal nerve block is performed by placing local anesthetic beneath the greater cornu of

the hyoid bone bilaterally. The recurrent laryngeal nerve is anesthetized via a trans-tracheal block where local anesthetic is placed on the trachea after piercing the cricothyroid membrane.

In the hands of those who do them frequently, upper airway nerve blocks have been shown to provide faster intubation, adequate airway anesthesia, and less patient discomfort to aid in AFOI in patients as compared to topical anesthesia using an atomizer.[61] A study by Mohanta et al showed that significant lesser time was required for performing AFOI when patient received ultrasound guided airway nerve block in comparison to nebulization of local anesthesia for airway anesthesia.[60]

In the authors' extensive clinical experience I have found that atomization is a very efficient and efficacious way of preparing a patient for awake intubation and it avoids the fear and discomfort caused by nerve blocks.

Comment 44

P19L2 you specifically discuss the benefits of cocaine use – are there any problems with its use- should they be discussed also? Eg lenders in American case reports

Reply 44

Added to text:

There are case reports suggesting that topical cocaine may be associated with increased risk of cardiac events, but recent studies have disputed this.

Comment 45

P19L18 given your extensive experience mentioned on the previous page, what safe dose do you use??

Reply 45

Corrected in text to:

Our group uses the higher dose recommendations and we have not experienced any complications as a result of it.

Comment 46

P20L6 should you include a statement that says testing the adequacy of topicalization is important??

Reply 46

Added to text:

Adequacy of anesthesia is determined by testing pharyngeal sensation with a tongue blade. Tolerance of an oral airway demonstrates adequate anesthesia of the hypopharynx.

Comment 47

P21L16 could this be a diagram- nasal versus oral versus in front versus behind curves

Reply 47

We have elected not to place a diagram

Comment 48

P22L1 how do you select the larger nares

Reply 48

Answered in text:

The larger nare is identified on the patient and its patency is confirmed by the patient determining that their ability to breathe through it is equal or better to the other nare.

Comment 49

P22L13 should you include a table comparing awake flexible intubation scope intubation versus awake videolaryngoscopic intubation?

Reply 49

We have elected not to include this table as the article is already lengthy

Comment 50

P23L1 doesn't your argument make the case for very minimal use of sedation rather than the use of HFNO?

Reply 50

Answered in text:

In addition, obese patients often have OSA and an unpredictable response to sedatives. It is prudent to use higher flow of oxygen using the standard nasal cannula or specialized high oxygen flow cannula to improve oxygen saturation and decrease the risk of desaturation during the procedure.

Comment 51

P23L8 Should you mention aintree catheter type techniques once anaesthesia has been induced?

Reply 52

Corrected in text:

There are numerous SGAs (Igel, Air-Q ,Ambu,etc.) and devices (Aintree catheter) that take advantage of the fact that a well placed SGA is sitting at the laryngeal inlet and doing a fiberoptic intubation through it is significantly easier.

Comment 53

P24L12-15 this could be expanded to explain why this problem occurs and why the solution is as suggested

Reply 53

Corrected in text:

When attempting intubation with video laryngoscopy, the difficulty encountered is usually passage of the ETT, rather than difficulty obtaining a view. The patient's head should be in neutral position with a "limited" glottic view. When applying excessive force to improve the videolaryngoscope view to grade I there is a tendency for the posterior tracheal wall to "bow" forward and block the entrance of the ETT through the vocal cords.

Comment 54

P24L16 – see suggestion for table earlier in this section comparing VL with AFOI

Reply 54

We elected not to place an additional table due to space reasons

Comment 55

P26L1 This paragraph isn't as clear as might be expected and consideration should be given to rephrasing- I think you are trying to say that afoi is not perfect and may fail.

However you do not mention the possibility of postponing the procedure of aFOI proves impossible – but the lines from P26L12 do not seem to add to this narrative- nasal jet ventilation is a rare skill available in a very few centres- consideration should be given to the educational message of these two sentences.

Reply 55

Corrected in text to:

It situations of elective surgery one may have the option of canceling the case and returning to manage the airway using a different technique on a different day.

Frequently the clinical situation does not allow for this. It is imperative to be aware, that in certain circumstances a change in plan to an invasive method of securing the airway is a wise option. This is well described in a case of a patient with a grossly edematous epiglottis overhanging the glottic opening with an ulcerative growth on the left vocal cord extending into the anterior commissure. Complications such as

bleeding from the ulcerated tissue can lead to loss of vision during fiber optic bronchoscopy and intubation and/or precipitation of laryngospasm.[88]

It important to note that even with an invasive strategy as a backup, that too may fail. A case report describes a patient with a retrosternal goiter presenting with respiratory distress. After failed AFOI, a tracheostomy was performed. However the insertion of varying sizes of ETT failed as they could not pass beyond the large obstruction in the distal trachea. Finally, a rigid bronchoscope was utilized, and ventilation was successful.[89]

Reference to nasal jet ventilation was deleted

Comment 56

P26L15 you should clearly state that this list comes from the aSA Guidelines (even though it is referenced)

Reply 56

Answered in text:

The ASA guidelines recommend Airway management of an unanticipated or emergency difficult airway consists of the following interventions:

Comment 57

P26L19 could some of these steps be expanded- when you state optimize oxygenation what do you mean?

Reply 57

Answered in text:

Optimization of oxygenation – ensure that the patient's oxygenation is adequate.
Consider interventions like HFNO which may improve the current state,

Comment 58

P26L21 Should you reference some cognitive aids?

Reply 58

Answered in text:

Use of a cognitive aid - Cognitive aids are prompts designed to help users complete a task or series of tasks especially during a stressful situation.

(Citation - Marshall S. The use of cognitive aids during emergencies in anesthesia: a review of the literature. *Anesth Analg*. 2013 Nov;117(5):1162-71. doi: 10.1213/ANE.0b013e31829c397b.)

Comment 59

P27 L1 you should certainly refer the reader back to your own list of non invasive devices earlier in the article

Reply 59

Changed text:

Noninvasive airway management devices – optimize mask fit, oral airway, nasal airway, SGA, Kingtube, etc.

Comment 60

P27L5 CICO should have a separate heading

Reply 60

Separate heading placed.

Comment 61

P28L19 Compared to DAS 2022 aSA takes human factor into consideration might be considered by some as unnecessarily antagonistic as the 2015 work contains an entire section on Human Factors! You are absolutely right to highlight the differences but phrased in this way you risk many adverse letters commenting on the paragraphs on HF in DAS 2015

Reply 61

Sentence removed

P28L19 human factors

Sentence removed

Comment 62

P28L20 it has been argued- this does not appear to be referenced and it should be- please amend

Reply 62

This line has been removed

Comment 63

P30L13 More details of the risks should be given- particularly over advancement and

oxygen administration

Reply 63

Added "Risk include over advancement of the tube exchanger causing irritation and coughing if the exchanger is in contact with the carina. Over advancement may also cause trauma to the bronchi. Oxygen administration via jet ventilation or insufflation has the potential to cause barotrauma."

Comment 64

Please check the references – many are given as a single author followed by et al- it is usual to use et al after three authors only when there are more than 6

Reply 64

References have been reviewed and updated as suggested.

Comment 65

Please also check that all of your assertions and statements are referenced- I have mentioned this a few times on the way through- but as this is a narrative review all statements should be referenced appropriately.

Reply 65

The paper was reviewed thoroughly and referenced appropriately. Where references were deficient, the text was removed.

Reviewer C

Comment1

Thank you for the extensive work on the manuscript and looking at all these aspects of dealing with airway management. This is an interesting summary of main teaching points of airway management; however, there are no new concepts described and all these topics have been mentioned many times before.

Reply 1

The paper was an invited review to discuss of the recognition and management of the difficult airway. The authors wished to present a thorough overview for general review. Although few new concepts are described, this was not meant to be the focus of the paper.

Editorial Comments (Please do not delete this section. Editorial comments should also be replied point by point)

Comment 2

Thanks for the efforts the authors put into this writing and the support to our journal.

Please check the comments from Editorial Office. Mainly, the comments below are used to increase the transparency of your manuscript.

1. Please follow the “Author Instructions”

(<https://joma.amegroups.com/pages/view/guidelines-for-authors>) and revise your paper if needed. Here are some additional points:

a. Conflict of Interest (COI) Form must be provided, as suggested by ICMJE: (<http://www.icmje.org/conflicts-of-interest/>). Each author should submit a separate form and is responsible for the accuracy and completeness of the submitted information. COI form download link:

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reply 2

COI forms provided for each author.

b. Please indicate if any of the authors is serving as a current Editorial Team member (such as Editors-in-Chief, Editorial Board Member, Section Editor) for this journal. State “None” in the reply if it’s otherwise.

None

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Figures, tables are original. No videos were submitted.

d. Structure of the original article

Due to the Author's Instruction (<https://cdn.amegroups.cn/static/public/2.2.3-Structure%20of%20Narrative%20Reviews-template-V2022.11.4.docx?v=1678776164908>), please kindly organize the structure of the manuscript, including the Abstract and Introduction.

Comment 3

Title

2. The title is not very informative regarding your objectives and key content. According to the PICO principle, we recommend authors include these keywords in the title (for your reference): recognition and management of the difficult airway, most recent guidelines. Additionally, you need to state "update" in the title.

Reply 3

Title changed to “ Recognition and management of the difficult airway – A narrative review and update on the most recent guidelines”

Comment 4

Abstract

3. Please add the time frame (year-month-day) in the Abstract Methods, rather than “past 5 years”.

Reply 4: The authors performed a focused literature review of guidelines for the management of the difficult airway from major related US and international societies from January 1993 – May 2022 as well as the most relevant references from the identified guidelines and to the topics discussed .

Comment 5

Please detailed describe the Key Content and Findings (what the literature review will mainly contain and any key findings).

Reply 5

Key findings and content added:

This review focuses on the identification and management of the difficult airway including the failed airway with focus on the updated 2022 ASA (American Society of Anesthesiologists) practice guidelines for the management of the difficult airway.

We describe recognition and management of the difficult airway including

equipment needed, innervation of the airway, techniques for nasal and oral awake flexible bronchoscopic intubation, sedation techniques, unanticipated difficult airway management, cannot intubate/cannot ventilate situation, extubation of the difficult airway as well as commenting on the various guidelines for management of the difficult airway.

Key findings suggest that careful assessment, decision making, anticipation and planning, as well as the skills of the anesthesiologists in airway management are the keys to favorable outcomes. Safe management of the difficult airway can be accomplished by having a thorough pre-operative evaluation with advance planning. Providing oxygenation throughout the airway management process, being cognizant of time and number of attempts are extremely important principles. Early consideration for surgical airway should a “cannot intubate, cannot oxygenate” clinical situation is encountered is a life- saving intervention.

Comment 6

Introduction

5 Given that there are some similar reviews in this field (PMID: 36482552, 35986748), please highlight the novelty of this review in the introduction. What does this review add to existing knowledge? How does this review differ from previous reviews?

Reply 6

This review gives a board overview on the recognition and management of the difficult airway, as well as management of the unanticipated difficult airway. Addition of a brief overview of the new 2022 ASA difficult airway guidelines along with traditional difficult airway management techniques allows for a concise and thorough review of difficult airway management.

Comment 7

Methods

Kindly include in your methods the time (year-month-day) of this narrative review conducted and the types (retrospective study, prospective study, clinical trial, etc) of articles included.

In addition, the authors are recommended to present the search terms commingled with Boolean operators / AND / NOT / OR. Please be noted that this is for more transparency. The article will not be quality judged based on the search issue.

Reply 7

The authors performed a focused literature review of guidelines for the management of the difficult airway from major related US and international societies from January 1993 – May 2022 to as well as the most relevant references from the identified guidelines and to the topics discussed. We searched Pubmed

using key words: awake fiberoptic intubation, flexible bronchoscopic intubation, flexible intubation scopes, emergency invasive airway, difficult airway management

The search was limited to the English language.

Articles included retrospective studies, prospective studies, clinical trials and case reports.

Items	Specification
Date of Search (specified to date, month and year)	01 May 2022
Databases and other sources searched	Pubmed
<p>Search terms used (including MeSH and free text search terms and filters)</p> <p>Note: please use an independent supplement table to present detailed search strategy of one database as an example</p>	<ul style="list-style-type: none"> -Difficult Airway -Awake Fiberoptic Intubation - Flexible bronchoscopic intubation - Flexible intubation scopes - Emergency Invasive Airways -Emergency Airway management
Timeframe	30 years

<p>Inclusion and exclusion criteria (study type, language restrictions etc.)</p>	<p>Inclusion</p> <ul style="list-style-type: none"> - English language only - Human studies - Retrospective studies - Prospective studies - Case Studies - All ages, sexes <p>Exclusion:</p> <ul style="list-style-type: none"> - Does not meet inclusion standards
<p>Selection process (who conducted the selection, whether it was conducted independently, how consensus was obtained, etc.)</p>	<p>All authors</p>
<p>Any additional considerations, if applicable</p>	

Comment 8

Main body

The research purpose of this article includes "reflecting on the most recent guidelines for difficult airway management", but the article only briefly explains the ASA

guidelines.

Reply 8

While we briefly commented on the ASA difficult guidelines at the end of the manuscript, many of the guidelines' concepts and recommendations have been discussed throughout the manuscript.

Comment 9

We hope the authors give a summary and analysis of different countries (UK, USA, Canada, etc.) the latest guidelines for the management of the difficult airway, details about the contents of the updated guidelines, the reasons for the updates, and the impact of the changes on the clinical practice. Please also add a table for this content.

Reply 9

Thank you for this comment and request, we thus have re-arranged some sections of the manuscript and added additional details., we considered adding a table for this content, however we thought that would be a fruitless academic exercise, as the parts of the guidelines that are based on evidence are about the same in all , and the differences lie in the areas that depended on the expert consensus which the readers of those guidelines in the country where it is produced and published will follow as the experts on the respective taskforce represent the members of the said society. We thus added some more details that we thought to be helpful vs. adding a table.

We added more detail on the 2022 difficult airway guidelines:

The reader is encouraged to review the entire article, however we herein highlight some of

The important concepts included in this 2022 update.-

Updates highlights:

- International 15 members task force
- 12 national and international societies
- More inclusive of clinicians, and settings
- Decision tool
- Emphasis on the number of attempts
- Emphasis on the passage of time: earlier invasive airway
- Infographics for both adult and pediatric patients
- New pediatric algorithm
- Emphasis on provision of O₂ throughout the management of the difficult airway , including extubation
- More robust recommendations for the extubation of the difficult airway
- Human factors in DA management
- New list of suggested contents of standard anesthetizing location

The guidelines as always start with highlighting the importance of airway evaluation, and if we may add by the clinician responsible for managing this airway at hand. Moreover, detailed recommendations are provided for preparing for management of the difficult airway, as it is said, that failure to plan, is a plan to fail. The decision making tool is a new feature that should be examined very carefully. It includes the consideration for awake airway management in patients with high risk for aspiration, and/or those who cannot tolerate a brief apneic episode.

The ASA 2022 new pediatric difficult airway algorithm and infographic is a welcome addition to the very popular “ASA DA algorithm” It follows almost the same principles regarding managing adult patient in terms of airway evaluation, and management, albeit with a focus on the concept of functional vs. physiologic airway obstruction reminding clinicians of the need to monitor the patient’s depth of anesthesia and muscle relaxation during the process of managing the difficult airway.

Also recommendations were provided for the extubation of the difficult airway highlighting that it is an elective procedure. And finally follow up steps after a DA encounter.

A list of human factors that may contribute to the management of the difficult airway is provided, as well as suggested contents for the standard anesthetizing location, and difficult airway cart.

We also added the paragraph below giving the summery and analysis from different countries:

Despite considerable progress in difficult airway management, it is still a major contributor to patient morbidity and mortality, particularly brain damage and death.²⁰ In fact, 25-46% of anesthetic related deaths are associated with difficult airways.²¹ Moreover there has been an increase in the body of knowledge and advances in technology . Thus major international Anesthesiology societies have issued/ updated their guidelines with the hope that the updated guidelines will keep practitioners abreast of the new concepts, technology and trends in safe airway management. The American Society of Anesthesiologists (ASA) first published practice guidelines for the management of the difficult airway was in 1993.⁷ In those first guidelines the fiber optic scope received wide commendation in its role as an essential tool for airway management. The guidelines were updated in 2003,⁸ 2013,¹⁰ and again in 2022.¹¹ The Canadian Airway Focus Group (CAFG) initially also made

recommendations in 1998 with updates in 2013.^{13,14} They were further updated in 2021.^{15,16}

The Difficult Airway Society (DAS), based in the United Kingdom also issued guidelines for management of the difficult airway IN 2004 that was updated in 2015.¹⁷

In 2022, PUMA (Project for Universal Management of Airways) worked with several international airway societies including Difficult Airway Society, Society for Airway Management, European Airway Management Society, All India Difficult Airway Association, Canadian Airway Focus Group, Safe Airway Society, International Airway Management Society to develop a consensus guideline for providing a foundation for airway management.¹⁸

The three main guidelines are independently developed by 3 totally different groups of National/international airway experts. They are all well thought out and dependent on the available literature evidence and when evidence was lacking then consensus of expert opinion. Resulting guidelines differed as they depended on the standards and local practices in their respective country of origin. The DAS guidelines focused on the unanticipated difficult airway, while the ASA and CAFG guidelines addressed both the anticipated and unanticipated difficult airway. The ASA and CAFG included within them recommendations for the Extubation of the difficult

airway, while the DAS decided to have a separate guidelines for the same as well as their own version of guidelines for the awake tracheal intubation.

One example of the differences in recommendations between different guidelines is the establishment of emergency invasive airway access, the DAS guidelines as well as the Canadian guidelines strongly recommend the scalpel bougie technique, while the ASA calls for other alternative techniques, this is discussed in detail elsewhere in this review.

Another example of differences in guidelines recommendations is regarding the patient with full stomach and at high risk for aspiration. Both the Canadian and the ASA guidelines recommend awake intubation to minimize the risk for aspiration, while the DAS guidelines recommends Rapid sequence induction with cricoid pressure as means to prevent regurgitation and aspiration.

Moreover, the ASA describes the failed airway emergency as cannot intubate cannot ventilate (CICV) while the CAFG and DAS Guidelines describes it as Cannot Intubate Cannot Oxygenate (CICO). At the risk of being biased, as our senior author (BA) was a member of the ASA taskforce to update the DA practice guidelines, The authors prefer CICV, as Oxygenation (measured by O₂ Saturation pulse oximetry) can be misleading and it would remain stable for some time while there is no ventilation,²² and as soon as it starts to drop it does so rapidly and may not allow for adequate time for intervention with a deadly sequelae, however lack of ventilation would give an early warning of the challenge and thus allows for time to move on to the next

step in the planned airway strategy and/or early decision to proceed with invasive airway. Additionally, ventilation includes oxygenation within it as ventilation without oxygenation is a lower airway/lung parenchyma challenge not an upper airway challenge that these guidelines are concerned with. Regardless, it seems like most clinicians will follow the guidelines of the society that serve their practice/country.

comment 10

Though it is a review, a separate section on the STRENGTHS and LIMITATIONS of this review is highly recommended. We think this could promote a more intellectual interpretation.

Reply 10

Our review covers a broad range of airway related literature over a period of 20+ years as well as focusing on the most recent ASA guidelines. This wide span of coverage allows the reader a comprehensive overview of airway management techniques. Limitations include the fact that many articles were not included thus we may have a limited overview of how the difficult airway is managed. Articles not in english were excluded and thus cultural differences in airway management me be

amiss. Again, presented here are only recommendations and guidelines based on the literature and the reader must establish best practices for their own institutions.

Comment 11

Conclusion

The conclusions should describe the main contents and findings and how the review may potentially impact future research, clinical practice, and policy-making.

Reply 11

Added: We present a thorough review of evaluation and management of the difficult airway in this review article including the topic of difficult extubation. Careful assessment, decision making, anticipation and planning, as well as the skills of the anesthesiologists considering the human factors in airway management are the keys to favorable outcomes. Safe management of the difficult airway can be accomplished by having a thorough pre-operative evaluation with advance planning. Providing oxygenation throughout the airway management process, being cognizant of time and number of attempts are extremely important principles. Early consideration for surgical airway should a “cannot intubate, cannot oxygenate” clinical situation is encountered is a life- saving intervention. This review gives a thorough overview of difficult airway management, including presentation on differing guidelines as well as specific focus on the ASA difficult airway 2022 updated guidelines. This will allow the reader to best decide what equipment, training and policies they wish to establish for

their home institutions.

Comment 12

Other concerns

Please give a table legend (P.8). The Timeframe (20 years) in the table is inconsistent with Methods (past 5 years), please explain or amend it.

Reply 12

Comment 13

The Timeframe in the table is the time span (year-month-day) of the retrieved literature. Also, you need to cite the Table in the Methods.

Reply 13

Table was amended as per above instructions

Comment 14

Please define ALL abbreviations mentioned the first time, such as OSA (P.11, L.8), ECMO (P.12, L.12) and etc.

Reply 14

Abbreviations defined

Comment 15

Some points lack evidentiary support. The corresponding references should be cited.

For example,

P.10, L.18-20 "Some of the conditions ... cysts, and abscesses."

Reply 15

References 27-39 are the corresponding references for the sentence "Acquired and congenital conditions have also been identified by case reports as having an association with difficult airway. Some of the conditions described in case reports include Down syndrome, Treacher- Collins syndrome, Hodgkin's disease, osteoarthritis, ~~Temporomandibular joint disease~~^{MJ}, cysts, and abscesses. In general, conditions associated with abnormal patient anatomy and mobility effecting management of the airway may increase the likelihood of a difficult airway." and are included at the end of the paragraph.

Comment 16

P.16, L.13-14 "However, airway obstruction ... obstructive sleep apnea."

Please recheck the full text to ensure all the statement is evidence-based (not just the above).

Reply 16

Sentence " however airway obstruction has been reported with higher doses in obese patients with obstructive sleep apnea." Has been removed

Comment 17

P.33, L.2-3 “With this technology, anesthesiologists can make individual decision to minimize the risk of perioperative aspiration. [113-125]”, generally, it is best not to have more than 10 references for one argument.

Reply 17

References reduced

Comment 18

Please phrase the place (source 1, pages 24-27 and 29-32) highlighted in the attached

Similarity Report.

Reply 18: similarity report could not be accessed. Please resend

Comment 19

Funding information is missing.

Reply 19

No funding was received for this review article.