Airway Update

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WAMM 2019 through COVID-19" My thoughts on Emergency Airway Management - **OPTIMISATION"**

I was fortunate to attend the World Airway Management Meeting in Amsterdam in November 2019. (I recommend if anyone wants to view this see twitter @WAMM_2019) This was the second World Airway Management Meeting to be held. The inaugural WAMM was held in Dublin in 2015. The Difficult Airway Society (DAS), the Society for Airway Management (SAM) and the European Airway Management Society (EAMS), combine their annual scientific meetings to producing a highly successful world class congress. These are some of my thoughts following this meeting.

In the broadest sense what I came away thinking was that "We need to try and simplify airway management". We need a common language and a shared mental model in emergency airway management. This has to be across the three main specialties that management emergency airways (Emergency medicine, Intensive care and Anesthesia).

Thoughts from the VORTEX work shop

Likes - the terms and concepts I came away with were - **Upper Airway Life Lines**, **Green Zone**, **Best effort** and **Optimisations**.

Upper Airway Lifelines *- the three upper airway lifelines of*
Face mask (FMV),
Supraglottic airway (SGA)
Endotracheal tube (ETT)

They are equally able to fulfil the goal of alveolar oxygen delivery but differ in their ability to fulfil secondary goals such as airway protection, airway security, and carbon dioxide elimination. Whilst important, these secondary goals become inconsequential if alveolar oxygen delivery cannot be achieved.

Green Zone *refers to any situation in which adequate alveolar oxygen delivery can be confirmed and the patient is no longer at imminent risk of critical hypoxia. The essential question to be answered to identify entry into the Green Zone is "Can adequate alveolar oxygen delivery be confirmed?".*

Confirmation: this will typically involve ensuring that ventilation with oxygen is occurring by the presence of an $ETCO_2$ waveform and/or rising SpO_2 reading.

Adequacy: the adequacy of alveolar oxygen delivery is not defined numerically but is instead assessed by asking "Is the patient likely to suffer harm from hypoxia if this level of SpO_2 persists for the next 15 minutes?". The absolute SpO_2 value satisfying this criterion will vary according to the context.

So for me this highlighted the importance of Waveform Capnography in determining Alveolar Oxygenation. This made me think how we tend to concentrating of SpO_2 values in difficult airway situations. Maybe we need to refocus the attention on whether we have a $ETCO_2$ trace. The green zone really is a time to take a breath yourself and plan.

In regards to capnography it reminded me of The Royal College of Anaesthetists (RCoA) and the Difficult Airway Society (DAS) collaboration in 2019 re **Capnography: No Trace = Wrong Place**. The important message that during

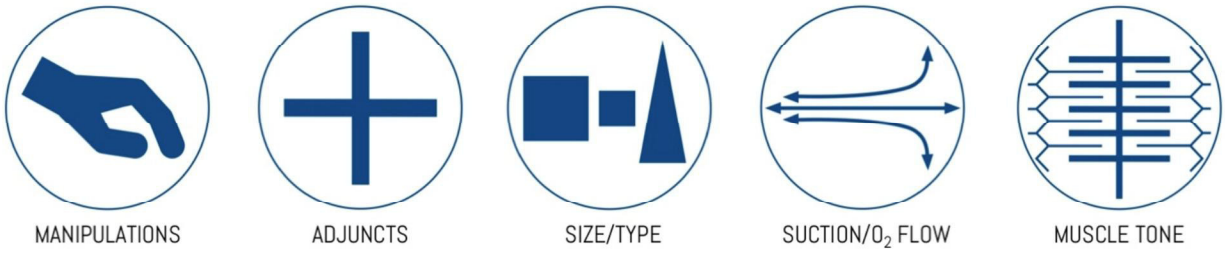
cardiac arrest, if a capnography trace is completely flat, oesophageal intubation should be assumed until proven otherwise (https://rcoa.ac.uk/safety-standards-quality/guidance-resources/capnography-no-trace-wrong-place)

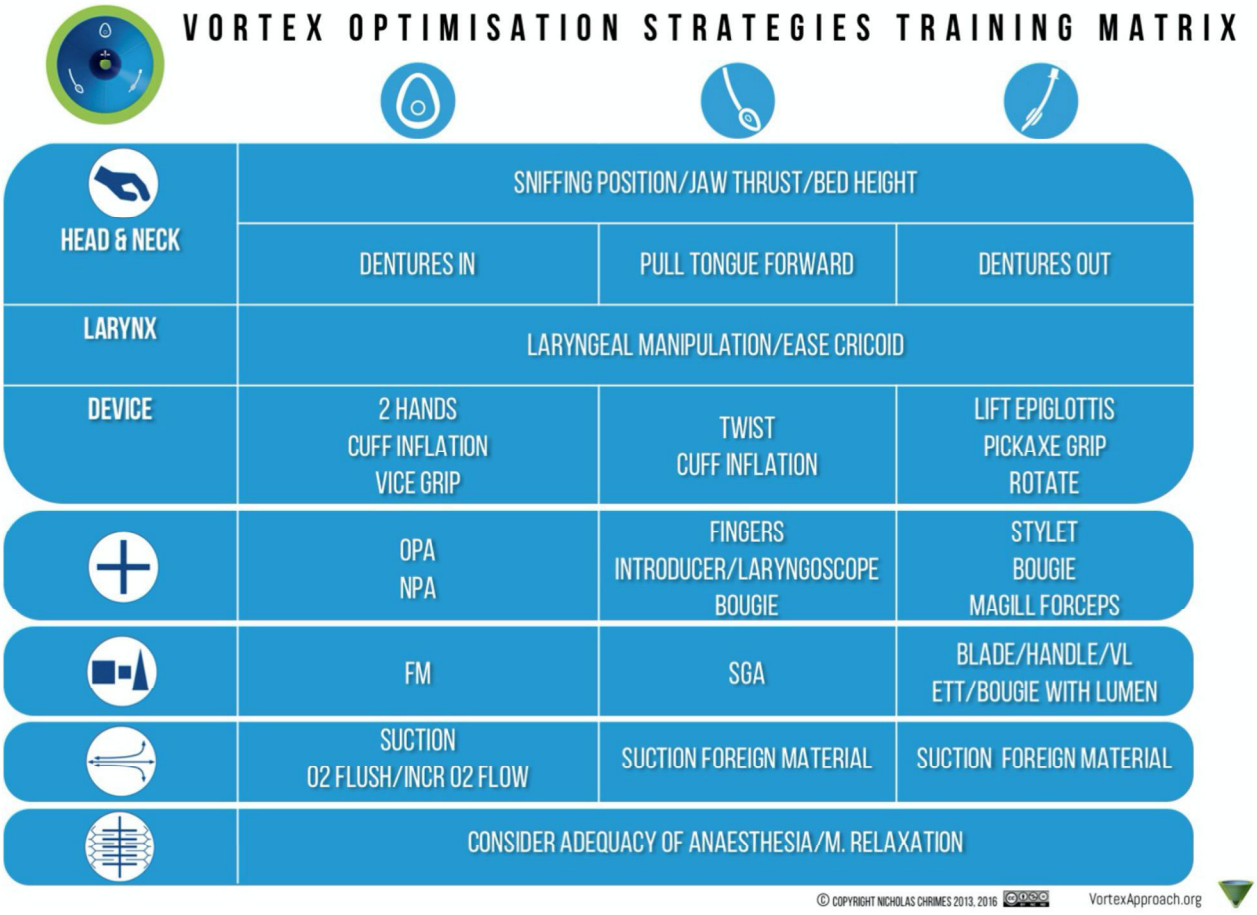
*The term '**best effort**' is used by the Vortex Approach to describe the circumstance in which all viable strategies to facilitate success at entering the Green Zone via a given lifeline have been implemented. The Vortex model prompts five categories of **optimisation** that may be applied to improve success entering the Green Zone via any of the lifelines.*

I like the term **optimisations.** The ones which are consistent across all three upper airway life lines are

Positioning - sniffing, 'flextension', bed height.
Easing (removing!) cricoid
Muscle relaxation - "a best effort at any lifeline must include full muscle relaxation"

For **FMV** my take home was Oral / Nasal airways and the **V-E grip**





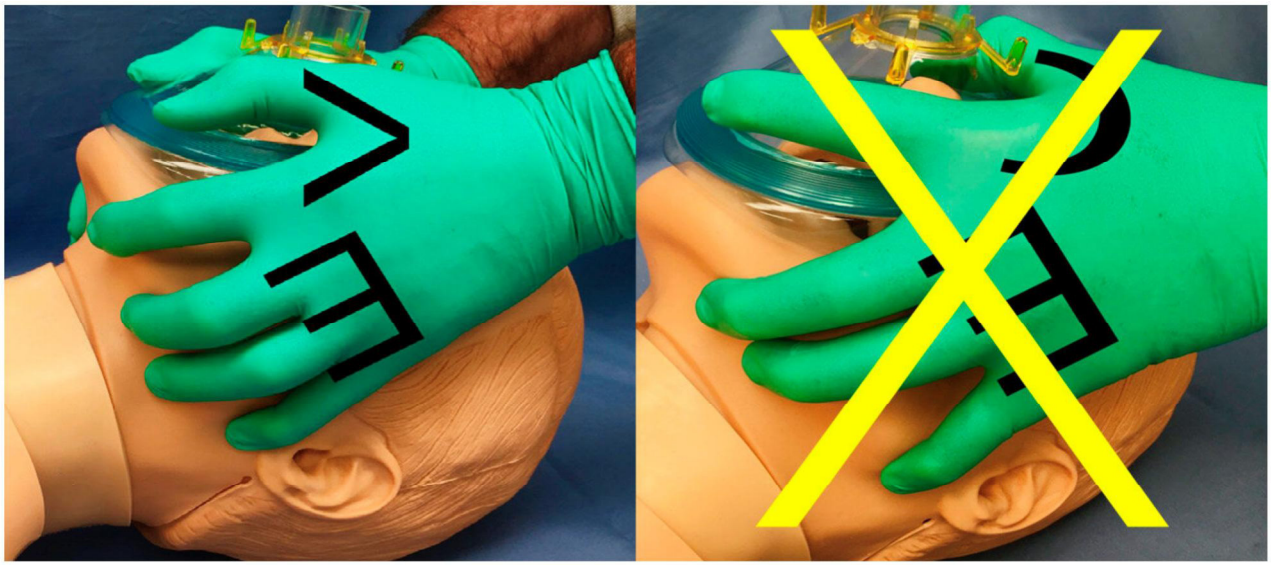
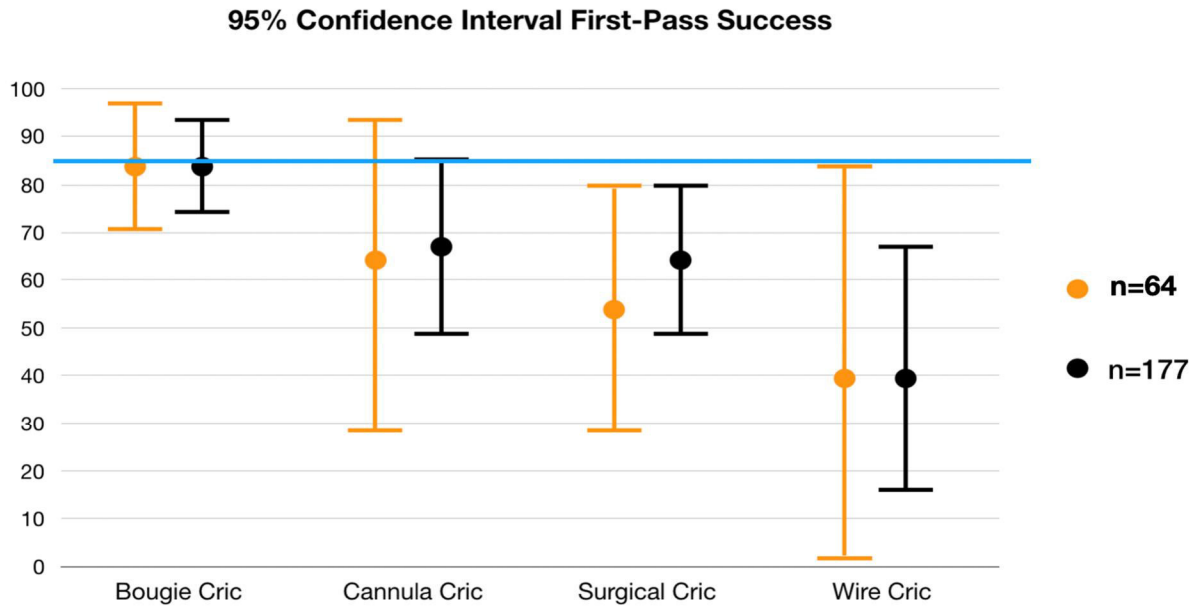


Figure 4 2-handed 2-person BMV technique with the 'VE hand position', the second person squeezes the bag. Figure a shows what to do ('V hand position') and figure b what not to do ('C hand position')

Dislikes- CICO ("ky-koh"). I struggle after hearing all the different pronunciations to think this is the correct term to use in an emergency situation. Also this seems a very anaesthesia driven term and certainly wasn't familiar to other specialties and regions outside Australasia in the workshop .I personally think **Front of neck Airway (eFONA)** is a better term.

Emergency front of neck airway WAMM-19 - Laura Duggan presented the ongoing data from the AIRWAY APP (http://www.airwaycollaboration.org) There was then 37 months of input data from 39 countries. 177 reported CICO events. Male 76%, BMI <40 72%, Obstructing Airway Pathology 41%, Non-surgeons 92%



So the only reported technique from this data that has approximately 85% first pass success is Bougie Scalpel Cricothyroidotomy. Some may argue about the relevance of this self-reporting study and its associated biases. However I do think this provides support for the move to a scalpel bougie technique for rescue of the CICO patient. It doesn't obviously state which Scalpel technique to use! I think the slightly more interesting story from

this data is that in the reported CICO cases - 35% of the times a SGA had not been tried and 42% of the time a muscle relaxant hadn't been given.

Intubation in Emergency Airways - ETT placement - Optimisation
Taken from Redirecting the Laryngoscopy Debate and
Optimizing Emergency Airway Management George Kovacs and Richard Levitan

We would all agree that videolaryngoscopy (VL) can be very useful in cases of difficult laryngoscopy. It is certainly beneficial in teaching and supervision of juniors. The visualization of the glottis is almost always improved however this doesn't always equate to passing a tube in to the glottis. Interpreting the growing literature comparing VL to Direct laryngoscopy (DL) is complicated for many reasons foremost of which relates the heterogeneity VL devices on the market. There are two major classes of commonly used VL devices, defined by the shape of the blade.

- Macintosh shaped ("standard geometry") VL blades (SG-VL) allow both video (indirect) and direct visualization,
- "Hyperangulated" (HA-VL) devices provide visualization only through the video camera and monitor.

Macintosh Shaped

In the highly quoted Driver et al. study, where a SG-VL device was used in 98% of cases, they reported using the screen in approximately half of cases. Most impressively, this study set a potentially new benchmark for rapid sequence intubation (RSI) in the ED with a 98% FPS when a bougie was used routinely with a SG-VL device. Similarly, in a recently reported prehospital RSI study Angerman et al. documented FPS of 98% when a bougie was used in combination with a SG-VL device. These studies, with signals from meta-analyses of other studies, show growing evidence that "optimized" SG-VL laryngoscopy may provide superior outcomes (FPS) compared to conventional DL. Compared to DL, putting a video camera element near the end of a conventional Macintosh, SG-VL blade provides an undistracted, larger, and wider view of the larynx in isolation. Using a bougie "optimizes" SG-VL (with or without video augmentation) by improving tracheal tube (TT) delivery and FPS.3,4 In the study by Driver et al., when operators encountered the common Cormack-Lehane (C-L) Grade 2 view, there was a significant benefit of a bougie for first-pass successful tube placement (97% bougie vs. 66% stylet).

Routine first-attempt optimization maneuvers with a standard geometry blade device (VL or DL)

- **proper positioning** with head elevation with ear-to-sternum alignment
- **bimanual laryngoscopy** (by the operator using their right hand) to provide manipulation of the larynx externally
- **use of a bougie**

Video example of "Optimized SG-VL (Mac VL)"for patients including those with suspected COVID-19: https://vimeo.com/404041551

Hyperangulated Shaped

The components of optimised hyperangulated VL are less well defined. It is dependent on navigating two opposing curves (primary and secondary curves)

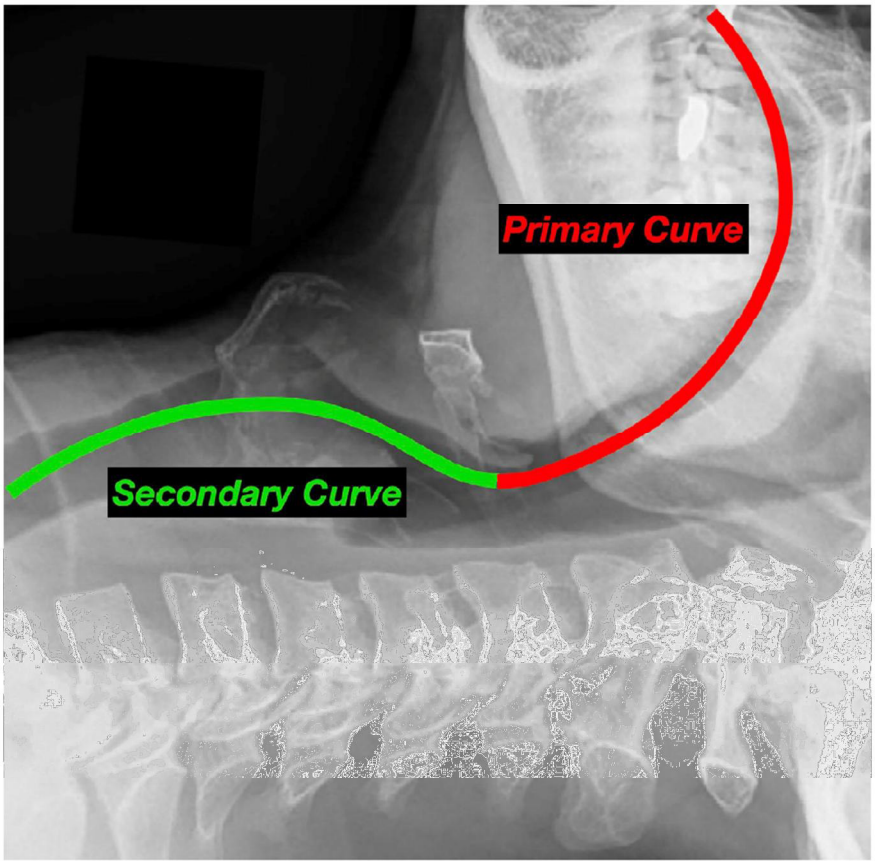


Figure 1. The primary curve (*red*) transitions into an opposing secondary curve (*green*).

Maximizing laryngeal exposure (seeking a C-L Grade 1 view) when using a hyperangulated blade can increase TT placement problems by **decreasing** the viewable space between the camera and the vocal cords as the tube is navigated to and through the laryngeal inlet. With HA-VL, a C-L Grade 1 view on the screen represents an "around-the-corner" target where the TT must be navigated around a minimally displaced tongue (primary curve), up (anterior) to the laryngeal inlet, and then transition acutely down the trachea (secondary curve) as it descends posterior into the chest. A limited literature and a growing experience suggests that success using HA-VL may improve by seeking deliberately restricting (C-L Grade 2) view (i.e., keeping the glottis < 50% of screen real estate and percentage glottic opening < 50%; see Figures 2B and 2C).

Using a **styletted tube** with a modest **60–70 degree** distal bend will help an operator navigate the tube around the hyperangulated blade and enter the larynx. Once the tube enters the larynx, the **stylet can be partially withdrawn** (3–5 cm) to minimize distal impact and hold-up of the TT bevel on the anterior tracheal wall (cricoid or tracheal rings; Figure 3A). The tip of a standard left facing bevel TT may still catch the anterior tracheal rings as it is rotated upward, off a hyperangulated stylet.

Partially removing the stylet and then **rotating the TT to the right** (clockwise) should help overcome mechanical TT advancement issues by favorably aligning the distal TT with the axis of the trachea (Figures 3B and 3C).
Video example of "Optimized Hyperangulated (HAVL)"for patients including those with suspected COVID-19:
https://vimeo.com/404091445

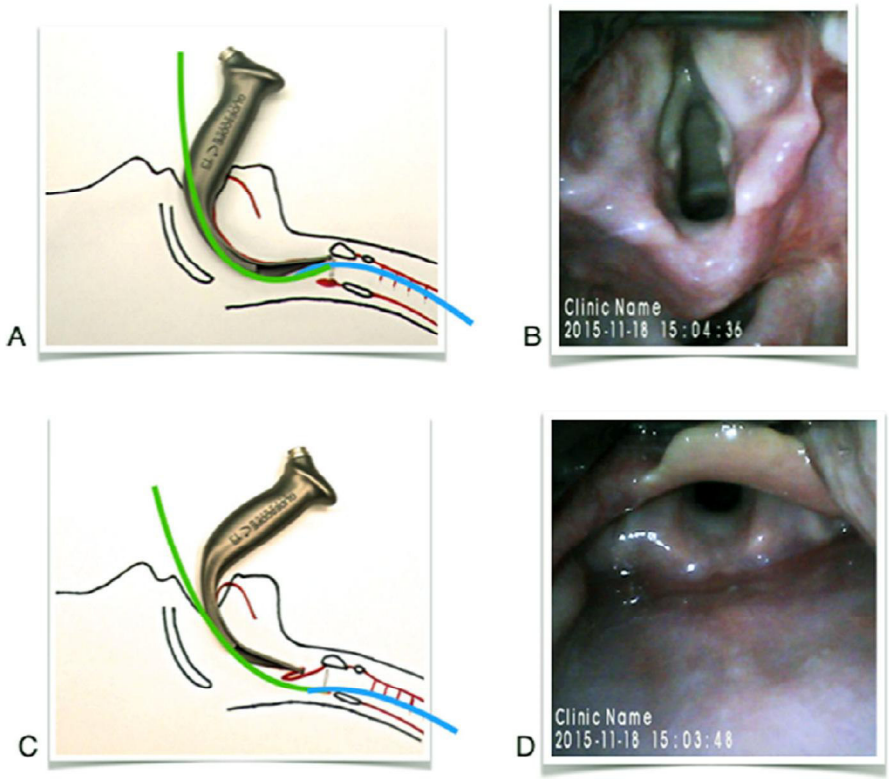


Figure 2. (**A and B**) Using a HA-VL device and having a full view of the laryngeal inlet with the blade posterior to the epiglottis, the distal blade camera is angled up toward the anterior trachea. This results in a more acute transition between the primary (*green*) and secondary (*red*) curves that must be managed by a styletted TT. (**C and D**) Using the same HA-VL device with the blade tip in the vallecula, anterior to the epiglottis. A 50/50 view on the screen (larynx occupying ~50% of screen and ~50% of laryngeal inlet in view) is achieved. The distal blade and camera are then more in line with the long axis of trachea. This positioning reduces the transition angle between the primary (*green*) and secondary (*red*) curves that must be managed by a styletted TT.

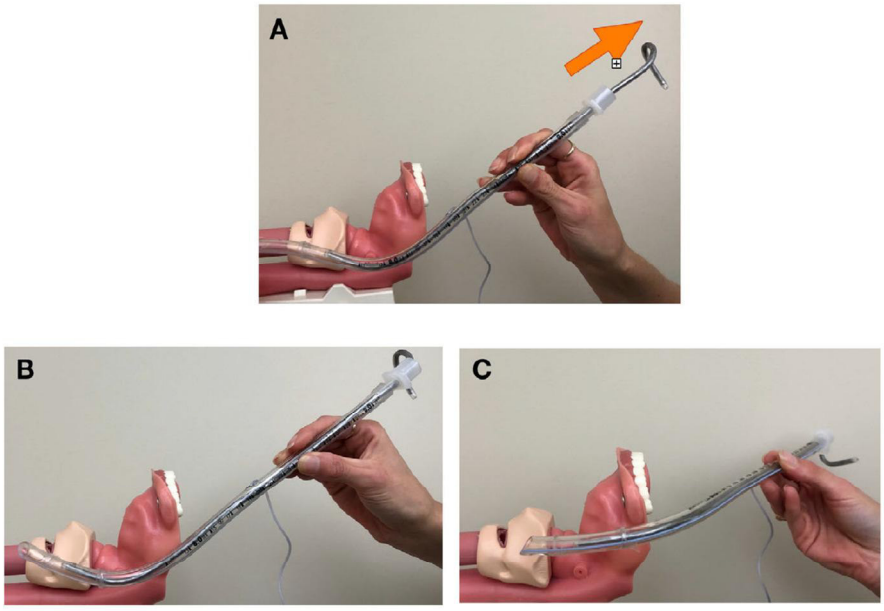


Figure 3. (**A**) Partially pulling back the stylet allows the distal advancing TT to transition posteriorly down the trachea. (**B and C**) By rotating the TT clockwise, the open face of the bevel is redirected anterior and the distal portion of the tube is better aligned with the tracheal axis.

Publications for 2020

1) PUMA -Project for Universal Management of Airways **https://www.universalairway.org**

The goal of the Project for Universal Management of Airways is to produce a set of principles that reflects, as much as possible, the consensus of existing published airway guidelines and can be applied to all episodes of airway care, across boundaries of geography, clinical discipline or context. The term 'universal' is used to reflect that the guideline developed will not only reflect international consensus but that it articulates appropriate management principles independent of:

Geography
Provider: anesthesiologists, emergency physicians, intensivists, neonatologists, pre-hospital clinicians, nurse anesthetists, airway assistants, surgeons - whether trainees or consultants
Patient characteristics: adult, paediatric, obstetric, trauma, critically-ill, fasted, unfasted
Indication: surgery, resuscitation, respiratory compromise, impaired conscious state, etc
Urgency: emergency, elective
Location: operating room, emergency department, intensive care unit, 'off-the-floor 'anesthetising locations, wards, prehospital
Complexity: routine or complex cases, independent of whether airway difficulty is anticipated or encountered
Primary intended airway: face-mask, supraglottic airway or tracheal tube.

The intention is for the universal guideline to complement existing guidelines by emphasising unifying basic principles, facilitating interdisciplinary team performance and assisting to standardise the approach to airway management globally.

They are an international and multidisciplinary working group of airway specialists. The working group is:

- Carin Hagberg, Anesthesiology, United States (Executive Chair)
- Nicholas Chrimes, Anaesthesiology, Australia (Project Lead)
- Paul Baker, Anaesthesia, New Zealand
- Richard Cooper, Anesthesiology, Canada
- Robert Greif, Anaesthesiology, Switzerland
- Andy Higgs, Anaesthesia and Intensive Care Medicine, United Kingdom
- George Kovacs, Emergency Medicine, Canada
- J. Adam Law, Anesthesiology, Canada
- Sheila Nainan Myatra, Anaesthesiology and Intensive Care Medicine, India
- Ellen O'Sullivan, Anaesthesia, Ireland
- William Rosenblatt, Anesthesiology, United States
- Christopher Ross, Emergency Medicine, United States
- John Sakles, Emergency Medicine, United States
- Massimiliano Sorbello, Anaesthesiology and Intensive Care Medicine, Italy

They have been assembled to determine the key issues to be addressed by airway management guidelines and review the existing guidelines in order to identify areas of consensus in relation to these. Where the working group identifies that strong consensus exists amongst airway guidelines on key issues, these will be adopted as the recommendations of the universal guideline. The input of a broader advisory group of airway practitioners will be sought, in combination with a selective review of the relevant literature, to support any recommendations made in the following situations:

- Where guideline recommendations on key issues diverge.
- Where key issues are not addressed by the existing guidelines in a manner that supports universal application of a recommendation.
- Where there have been recent significant developments in relation to key issues that are not widely reflected in the existing guidelines.
- As otherwise required in the judgement of the working and/or advisory groups.

The working and advisory groups for this project are comprised of physicians working in anesthesiology, critical care, emergency medicine, surgery and pre-hospital care and include representation from authors of most of the published practice guidelines produced by the various airway societies.

The PUMA project will produce four main documents that together provide comprehensive recommendations for airway management.

1.) Universal Principles for Airway Assessment: What should clinicians be looking for?
2.) Universal Principles for Airway Strategy: What should clinicians do in the face of their airway assessment?
3.) Universal Principles for Airway Rescue: What should clinicians do if it all goes wrong?
4.) Universal Principles for Communication of Airway Outcomes: What should clinicians tell the next person?

I am on the Advisory group to the PUMA working group so I am really looking forward to the Publication of recommendations hopefully this year.

2) Under review presently PS56 ANZCA

Guideline on equipment to manage difficult airways

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