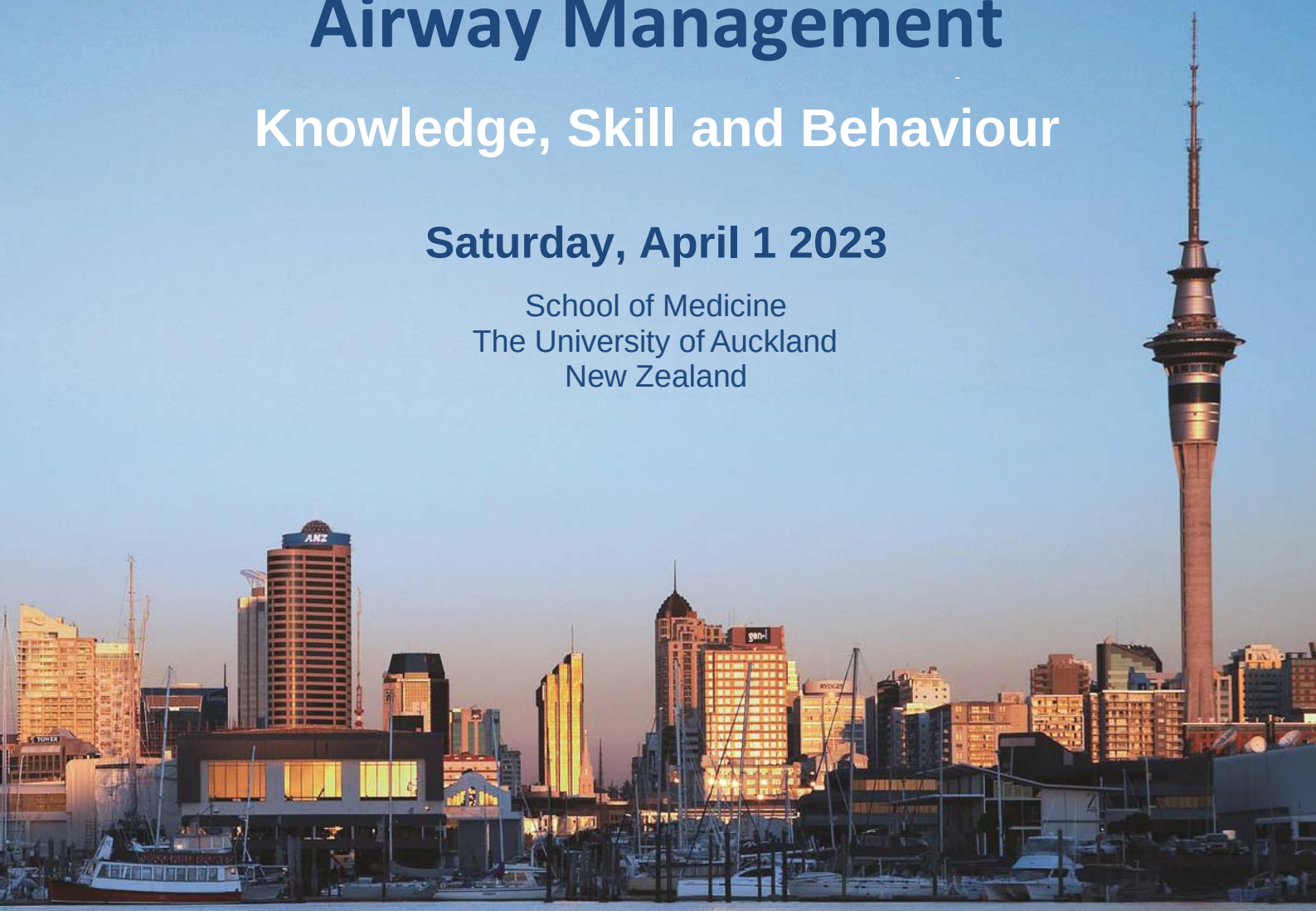
AUCKLAND CITY
SYMPOSIUM

# Airway Management

## Knowledge, Skill and Behaviour

**Saturday, April 1 2023**

School of Medicine
The University of Auckland
New Zealand



# Programme and Abstracts

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# Welcome

Welcome to the Auckland City Symposium 2023: Airway Management – Knowledge, Skill and Behaviour. It is so wonderful to be back running live symposium again, with international speakers. We are very grateful to our international and local speakers for accommodating the changes over the previous few years.

Airway management is a dynamic field that necessitates a continuous update in teaching and education to match its evolving practice. Our international faculty: Professor's Adam Law, Sheila Myatra and George Kovacs reflect the multidisciplinary and international nature of airway management. Together with our local faculty, they will cover a wide range of airway topics reflecting the evolution in practice over the past decade.

Through the sharing of best practice guidelines, addressing the role of human factors, and advancing the understanding of the latest techniques and technology, this symposium aims to provide airway providers with the latest knowledge, skills and behaviour to provide safe and effective airway management.

We are grateful to our industry partners for their generous support of this meeting. And thank you to all our delegates for continuing to support the Auckland City Symposium.

We hope you all enjoy the day.

ACS Convenor: Dr Paul Baker
ACS Scientific Programme Committee: Jeanette Scott, Paul Gardiner, Gemma Malpas
JAFA Organising Committee: Jee-Young Kim, Mark Welch, Helen Lindsay, Neil MacLennan

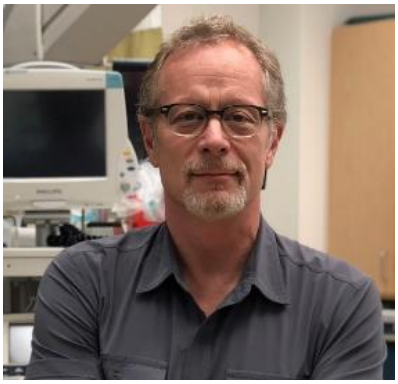
# International Faculty

**Professor Sheila Myatra**
*Professor of Anaesthesiology and Critical Care Medicine*

Sheila Myatra is a Professor of Anaesthesiology and Critical Care Medicine, working at the Tata Memorial Hospital in Mumbai, India. She is the Chair of the Intensive & Critical Care Medicine Committee of the World Federation of Societies of Anaesthesiologists (WFSA) and the President-Elect of the Indian Society of Critical Care Medicine (ISCCM). She is the Immediate Past President of the All India Difficult Airway Association (AIDAA).

She is on the American Society of Anesthesiologists (ASA) difficult airway guidelines and the PUMA guidelines (Project for the Universal Management of the Airway). She has led the development of the AIDAA difficult airway guidelines and the first guidelines for tracheal intubation in ICU. Her research interests include airway management, hemodynamic monitoring and sepsis. She has developed a new test in hemodynamic monitoring, called the “tidal volume challenge” (CCM 2017). She serves on the editorial board of Anaesthesia, CJA, JCC, Anaesthesia Critical Care & Pain Medicine, and others.

**Professor George Kovacs**
*Professor of Emergency Medicine*



Dr. George Kovacs is a full-time professor of Emergency Medicine and the Department of Anaesthesia, Department of Medical Neuroscience, and Division of Medical Education at Dalhousie University. He works clinically as an Emergency Physician and Trauma Team Leader at the Queen Elizabeth II Health Sciences Centre in Halifax. He has authored and edited textbooks and numerous publications on airway management. He is a senior author of the most recent Canadian Airway Focus Group guidelines for managing the difficult airway and a member of the lead working group for the Project of Universal Management of Airways (PUMA) consolidating international airway guidelines for all disciplines.

**Professor Adam Law**
*Professor of Anesthesia*

Dr. Adam Law is Professor of Anesthesia at the QEII Health Sciences Centre in Halifax, Nova Scotia, Canada. He started medical practice with 6 years as a rural general practitioner. This was followed by a residency in Anesthesia and subspecialty training in neuroanesthesia at Western University in London, Ontario, Canada. He has worked in Halifax, Canada as an attending anesthesiologist ever since. Adam is co-director of the Canadian AIME airway courses and director of the US-based Difficult Airway Course (Anesthesia version) and teaches both courses on a regular basis. He also chaired the Canadian Airway Focus Group for their 2013 and 2021 updates to airway management recommendations and is a working group member of the Project for the Universal Management of Airways (PUMA) initiative. When not at work, he enjoys spending time with his family as well as hiking and skiing.

# New Zealand Faculty

## Speakers

| | |
|---|---|
| Assoc Prof. Paul Baker | Specialist Anaesthetist, University of Auckland |
| Assoc Prof. Craig Webster | Psychologist, The University of Auckland |
| Mr David Vokes | Head and Neck Surgeon, Auckland City Hospital, Te Toka Tumati |
| Matthew Payton | Physicist, General Manager, Fisher and Paykel Healthcare |

# Programme

| | | |
|---|---|---|
| 0800 | Registration Desk Open – Exhibitor Area, Atrium, School of Medicine | |
| 0815-0825 | Opening and welcome | |
| **SESSION 1:** | **Practice Guidelines** | **Chair: Dr Paul Baker** |
| 0825 - 0855 | Consensus airway management guidelines – key insights from a lead author | Prof Adam Law |
| 0855 - 0925 | Airway guidelines – what relevance do they have in the emergency department | Prof George Kovacs |
| 0925 – 0955 | The physiologically challenging airway | Prof Sheila Myatra |
| 0955 – 1010 | Panel discussion | Panelists |
| 1010-1040 | Morning Break – Exhibitor Area, Atrium, School of Medicine | |
| **SESSION 2:** | **Error in airway management** | **Chair: Dr Jeanette Scott** |
| 1040 – 1055 | Oesophageal intubation | Dr Paul Baker |
| 1055 – 1130 | The dangerous airway – environmental, contextual and human factors influencing airway management | Prof George Kovacs |
| 1130 – 1145 | Thinking fast and slow – why highly trained people still occasionally do the wrong thing | Dr Craig Webster |
| 1145 – 1200 | Panel Discussion | Panelists |
| **SESSION 3:** | **Awake intubation for anaesthesia and ED** | **Chair: Dr Gemma Malpas** |
| 1200 – 1230 | Awake intubation for anaesthesia and ED | Profs Law & Kovacs |
| 1230 – 1240 | Panel discussion | Panelists |
| 1240 – 1340 | Lunch Break- Exhibitor Area, Atrium, School of Medicine | |
| **SESSION 4:** | **COVID airway management and HFNO** | **Chair: Dr Paul Gardiner** |
| 1340 – 1410 | Airway management in patients with COVID-19 – lessons learnt in India | Prof Sheila Myatra |
| 1410 – 1425 | Current concepts in use of high flow nasal cannula for airway management | Mr Matthew Payton |
| 1425 – 1435 | Panel discussion | Panelists |
| **SESSION 5:** | **Case discussions** | **Chair: Dr Jeanette Scott** |
| 1435 – 1450 | Laryngeal trauma – a case discussion on multidisciplinary airway management | Mr David Vokes |
| 1450 – 1525 | Quick fire cases – A panel discussion | Panelists |
| 1525 – 1600 | Afternoon Break - Exhibitor Area, Atrium, School of Medicine | |
| **SESSION 6:** | **Tips and Tricks** | **Chair: Dr Paul Baker** |
| 1600 – 1630 | Common causes of trouble – how to prevent or address them before they make it into morbidity studies | Adam Law |
| 1630 – 1650 | Little answers to big questions. A Q&A Panel discussion | Panelists |
| 1650 – 1700 | Closing comments and future meetings | **JeeYoung Kim & Mark Welch** |
| 1700 – 1800 | Drinks and Nibbles - Exhibitor Area, Atrium, School of Medicine | |

# Consensus airway management guidelines – key insights from a lead author


## Prof. Adam Law

*Professor of Anesthesia*


Airway management morbidity has been reported over many years in closed legal claim and other studies. All point to recurrent, yet preventable management issues. Airway guidelines have evolved from the need to address these issues. These have been published and updated by several countries and airway societies, with an overarching goal to advance a structured approach to difficulty encountered in the unconscious patient. More recently, guidelines have expanded to include safe planning and implementation of airway management when difficulty is anticipated.

Canadian airway guidelines have been published on three occasions: in 1998, 2013 and 2021. For the latter two updates, recommendations were split into two articles: one addressing difficulty occurring in the induced patient (1) and one addressing anticipated difficulty (2). Updated US ASA difficult airway guidelines were published in 2022 (3).

Most airway guidelines provide advice for (a) difficult or failed tracheal intubation when fallback use of face mask ventilation (FMV) or supraglottic airway (SGA) ventilation is non-problematic and (b) failed laryngoscopy/intubation coinciding with difficult or failed fallback ventilation ("can't intubate, can't oxygenate", CICO). In the former instance, advice centers around progression from one type of device to another and limiting total attempts (e.g., to a maximum or three). After the three attempts, the clinician should pause to consider an exit strategy: options include allowing the patient to awaken (generally only an option in the context of elective surgery); placing an SGA to temporize; proceeding with another intubation attempt if equipment and a skilled individual can be sourced to address the preceding difficulty, or, in rare instances, proceeding with surgical airway.

Advice for the CICO situation includes recognizing its definition - to allow for the better and earlier identification of when it has occurred - and its implied default action (rapid emergency front of neck airway [eFONA]). Once recognized, rapid eFONA should occur. We recommend a scalpel-tube bougie technique for eFONA in the adult population.

The 2013 and 2021 Canadian guidelines and 2022 US ASA guidelines provide advice on how to approach the patient with anticipated difficulty with airway management. When airway evaluation suggests anatomic predictors of significant difficulty with tracheal intubation, the provider is advised to consider a series of questions to help decide whether the patient would most safely be managed by awake tracheal intubation, or whether, despite the predicted technical difficulty, it is reasonable to expect the safe management of the patient after the induction of general anaesthesia. The questions to consider include: (a) the degree of expected difficulty, (b) whether fallback ventilation using FMV and/or an SGA is also predicted to be difficult, (c) whether there are coexisting physiological issues that might compound risk to the patient were airway management to proceed after induction, or (d) whether there are other contextual issues that might impact a decision of how to proceed. Examples of contextual issues include no access to additional expertise or, to a device needed to manage the anticipated difficulty (e.g., a video laryngoscope). If any of the foregoing questions is answered in the positive (i.e., significant technical difficulty is predicted; fallback ventilation is also predicted to be difficult; there's a significant coexisting physiologic and/or contextual issue), the clinician is advised to consider awake tracheal intubation as a potentially safer option to secure the airway. If the answer to all questions is "no", then post-induction airway management might be safe to consider. Regardless of the chosen approach, when difficulty is predicted, extra attention should be devoted to the details of its implementation.

Without doubt, advice appearing in the many published airway guidelines is quite similar. At best, this represents a duplication of effort, and at worst, might introduce controversy on which guidelines to adopt. The Project for Universal Management of Airways (PUMA) is comprised of a group of airway-interested clinicians, who have the common goal of arriving at universal airway guidelines, applicable to all practice environments (4). They are due to report their results in a series of articles in 2023 and 2024.


1. Law JA, Duggan LV, Asselin M, Baker P, Crosby E, Downey A, et al. Canadian Airway Focus Group updated consensus-based recommendations for management of the difficult airway: part 1. Difficult airway management encountered in an unconscious patient. Can J Anaesth. 2021;68(9):1373-404.
2. Law JA, Duggan LV, Asselin M, Baker P, Crosby E, Downey A, et al. Canadian Airway Focus Group updated consensus-based recommendations for management of the difficult airway: part 2. Planning and implementing safe management of the patient with an anticipated difficult airway. Can J Anaesth. 2021;68(9):1405-36.
3. Apfelbaum JL, Hagberg CA, Connis RT, Abdelmalak BB, Agarkar M, Dutton RP, et al. 2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway. Anesthesiology. 2022;136(1):31-81.
4. Chrimes N, Higgs A, Law JA, Baker PA, Cooper RM, Greif R, et al. Project for Universal Management of Airways - part 1: concept and methods. Anaesthesia. 2020;75(12):1671-82.

# Airway Guidelines – what relevance do they have in the emergency department?


## Prof. George Kovacs

*Professor of Emergency Medicine*


To date airway guidelines have been aligned with national associations/organizations and for the most part discipline specific. Most existing guidelines address airway management performed in the operating theatre by anaesthetists. Other guidelines addressing airway management in the critically ill patient although not intended to be location specific, have been almost exclusively authored by anaesthetists. Critically ill patients may require airway management in any setting including the prehospital, emergency department (ED), ward, intensive care unit (ICU) or operating theatre environment. There currently are no existing emergency medicine airway management guidelines. All patients presenting to the ED requiring airway management are critically ill and it seems logical that existing critical care guidelines should directly apply to clinicians working in this setting. There has been a historical and cultural gap in many parts of the world on 'whose job it is' to manage the airway outside of the operating theatre with some evidence that an airway performed by a 'non-anaesthetist' represents a higher risk airway. This literature is biased by name tag assumptions of proficiency based on regional practice variations in the provision of airway management in the ED. 'Owning' the airway is about matching the provider and skill with the patient and environment and should be judged based on patient-centred outcome measures (more on this in my talk on the dangerous airway).

The Canadian Airway Focus Group (CAFG) was the first airway guideline to include emergency physicians as authors and refer to airway 'providers' as opposed to using discipline specific terminology. These guidelines have been integrated into national airway management educational programming (Airway Management & Interventions in Emergencies: AIME) delivered through the Canadian Association of Emergency Physicians (CAEP). In the Part 1 document on managing the encountered difficult airway in the unconscious airway, the algorithm begins with a failed first attempt at laryngoscopy and intubation. The progression stresses the importance of optimizing each attempt and avoiding repetition without a change in approach.

While the goal in most airway management algorithms is to successfully place a tracheal tube in preparation for a scheduled procedure, in the ED tracheal intubation is performed as part of the technical package of resuscitation. Ensuring optimal oxygenation/ventilation and correcting hemodynamics is vitally important in managing critically ill patients before tracheal intubation is attempted. Timely intubation in these patients has nothing to do with rapidly pushing drugs. The ABCs of resuscitation rarely require rapid deployment of a laryngoscope.

An unsuccessful laryngoscopy and intubation attempt must be followed by facemask or supraglottic ventilation before any further laryngoscopy. There is no prescription when to 'tap-out' after x number of intubation attempts in the CAFG guideline. As long as subsequent attempts represent a change whether that be with an untried optimization manoeuvre with the same device, using a different device or the presence of a more skilled provider up to three attempts may be appropriate. However, declaring a failed intubation can occur at anytime throughout this progression. Failed intubation in the context of maintained oxygenation and ventilation should direct the provider to an exit/'bail-out' strategy which most commonly involves placement of a supraglottic airway in the ED setting.

At any point after a failed intubation attempt, if rescue face mask or supraglottic ventilation does not reoxygenate the patient (poor or absent waveform capnography and falling saturations), the algorithm shifts to a time dependent can't ventilate/can't oxygenate (CVCO) scenario where the provider must

cognitively and verbally commit by declaring a failed airway (or whatever terminology you choose) and ready self and team for the need to do a XXXX (FONA, surgical airway, neck rescue, cut the neck cric etc). This *should happen without delay unless* there is an immediately available untried intervention that has a higher likelihood of success. This may include establishing neuromuscular blockade, a trial of intubation, or placement of an SGA. The risk at this juncture is that the airway provider delays initiation of an emergency front of neck airway in favour of re-attempting what has already failed. Performing a cricothyrotomy should never be perceived as a failure when indicated even if the procedure fails to rescue a dying patient. It is up to all providers to attain and maintain this skill for it to be a viable rescue option. While there is no evidence supporting one approach over another, the scalpel finger bougie approach is recommended by this author as the preferred tactile approach to securing a front of neck airway.

The CAFG Part 2 document addresses the approach to the anticipated difficult airway. This topic will be covered in a separate lecture. The decision of how to proceed with airway management assumes that in critically ill patients, delaying or cancelling the case is not possible. There may be rare scenarios where delay is the safest route. However, the main decision revolves around the safety of using a neuromuscular blockade as part of an RSI to secure the airway. This decision has historically revolved around assessing the patient's intrinsic anatomy or acquired pathology as a potential obstacle in safely and rapidly securing the airway with a tracheal tube. If high risk, then an awake approach should be considered. More recently it has been recognized that rendering a physiologically compromised patient apnoeic poses a significant risk, including a 3% incidence of postintubation cardiac arrest. Refractory hypoxemia, hypotension, acidosis, and right ventricular strain represent a cohort of patients that may be considered apnea intolerant from worsening critical hypoxemia, the effects of induction drugs and/or positive pressure ventilation. The physiologically difficult airway may warrant considering an awake approach. While awake tracheal intubation (ATI) may considered a safer approach for managing both anatomically and physiologically at-risk patients, this is predicated on them being cooperative enough to tolerate this approach. While some clinicians consider ATI relatively contraindicated in critically ill patients this 'default out' may be unwarranted.

If time allows, I will talk about the meaning of life and sing a Leonard Cohen song.

# The physiologically challenging airway

**Sheila Myatra**
*Professor of Anaesthesiology and Critical Care Medicine*

# Preventing unrecognised oesophageal intubation

**Prof Paul Baker**
*Professor, University of Auckland*

Reprinted with thanks and permission from the NZSA reference:

Dr P A Baker, New Zealand Anaesthesia Magazine, NZSA, p 16-18, December 2022.

## Introduction

Every year, patients die from unrecognised oesophageal intubation. This rare, lethal complication of airway management can occur to any patient of any age undergoing tracheal intubation. It can also involve any airway practitioner of any seniority or previous experience. This complication is usually an avoidable occurrence resulting from human error. Recent deaths internationally from unrecognised oesophageal intubation have heightened concern about this problem and resulted in a new consensus guideline from the Project for Universal Management of Airways (PUMA) and international airway societies, which has been endorsed by the New Zealand Society of Anaesthetists. In this article, the key recommendations from the PUMA document will be presented and discussed (Fig 1).[1]

## Key recommendations

These key recommendations arise after reading many cases of unrecognised oesophageal intubation. Certain important issues and recurrent themes occur which will be discussed in this article.

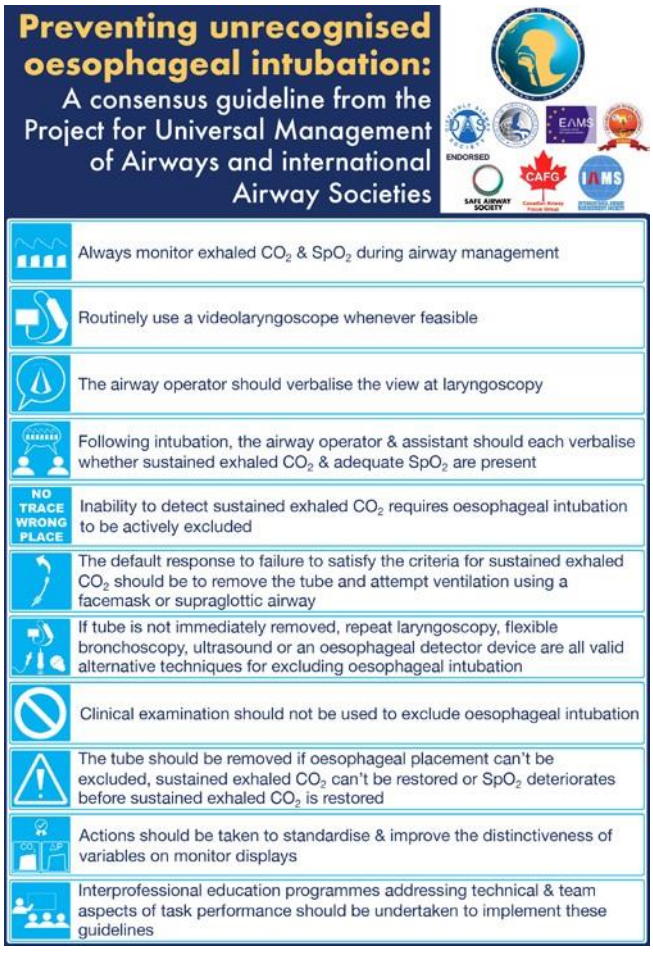



*Fig 1.*

## Monitoring

Waveform capnography is the "gold standard" technique to detect and monitor expired $CO_2$ and therefore identify the absence of expired $CO_2$ after oesophageal intubation.[2] It is the most reliable method to confirm and monitor tracheal tube placement even in low perfusion states, including cardiac arrest, with sensitivity and specificity rates of 100%.[3]

Various problems occur with capnography, including lack of availability in all areas where airway management takes place, failure to check the capnograph after tracheal intubation, misinterpretation of an absent waveform, lack of knowledge about the significance of variations of waveforms and confusion between capnography and other waveforms on a monitor (Fig 2). Each of these issues should be addressed with education and reflected in our ANZCA practice guidelines. There is also the need for willingness by practitioners to modify their own practices and adopt relatively simple measures outlined in the key recommendations described earlier (see Fig 1).

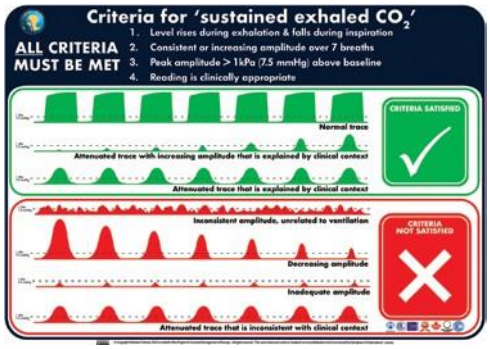



*Fig 2. Criteria for `sustained exhaled carbon dioxide´. This graphic has been designed to be used as both a foundation tool to be reviewed in advance of clinical use and an implementation tool to be referred to in real time during clinical practice [93]. A high-resolution version of this graphic is available for download at https://www.UniversalAirway.org/downloads. Printing and laminating this at A3 size is recommended.*

Early identification of an oesophageal intubation with capnography is essential to avoid severe patient morbidity or mortality. Using clinical signs of tracheal intubation including tube misting, chest movement and breath sounds on auscultation to exclude oesophageal intubation is unreliable and can result in delays in correct patient management. While clinical examination may be used to encourage removal of a tube, it should never be used to discourage it.

Pulse oximetry is not a replacement for capnography, but it is a useful adjunct for early diagnosis and monitoring the likelihood of an oesophageal intubation. Comparison of oxygen saturation before and after tracheal intubation in conjunction with capnography findings may accelerate correct diagnosis of oesophageal intubation. Conversely, reliability of sustained normal oxygen saturations can lead to false confidence, particularly after preoxygenation and other apnoeic oxygenation techniques, leading to delays in the management of an oesophageal intubation.

Flexible bronchoscopy is a helpful technique to confirm correct tracheal tube placement, particularly when there is concern about safe extubation in the face of a possible oesophageal intubation. Ultrasound has also been shown to be reliable for oesophageal intubation diagnosis, but these techniques can take time to implement and do not function for ongoing monitoring. In the absence of other more reliable monitoring, the oesophageal bulb will help identify tracheal versus oesophageal intubation using negative pressure from the deflated bulb to inflate in the trachea and not in the oesophagus (Fig 3)


*Fig 3. Algorithm for approaching failure to satisfy the criteria for `sustained exhaled carbon dioxide´ following passage of a tracheal tube. This algorithm has been designed to be used as an implementation tool [93], to be referred to in real time during clinical practice. Optimal use during clinical practice requires prior familiarity with the algorithm and guideline text. A high resolution version of the algorithm is available for download at https:// www.UniversalAirway.org/ downloads. Printing and laminating this at A3 size is recommended.*

## Tracheal intubation

The goal of tracheal intubation is to safely deliver an endotracheal tube into the trachea without causing hypoxia or trauma. The ideal technique involves slow sequential exposure of anatomy using an intubation device and oxygen. This technique is designed to correctly identify the glottis and avoid bypassing the airway on the way to the oesophagus, thereby mistaking the oesophagus for the glottis (glottic impersonation). (Fig 4). A range of intubation devices can be used to achieve this goal, but evidence suggests a videolaryngoscope reduces the risk of oesophageal intubation, improves the view of the glottis compared to direct laryngoscopy, and facilitates a shared view of the glottis which, combined with a verbal description of the laryngeal view, adds to the safety of the procedure.[4] The latest practice guideline recommends routine use of a videolaryngoscope whenever feasible. Where not currently feasible this recommendation should be considered aspirational.[1]

Not all intubations take place under ideal conditions, and multiple factors can contribute to a poor view of the glottis leading to an oesophageal intubation, particularly after a repeat laryngoscopy attempt. These factors can include poor preparation, inexperience, poor equipment, adverse patient anatomy and physiology, stressful conditions and distractions. Many of these factors can be improved if time is taken to optimise the intubation attempt.

Identification of correct tracheal intubation is a critical step, worthy of a few dedicated seconds, to confirm correct placement, with a witness, and to identify a sequence of capnography waveforms which meet the criteria for 'sustained exhaled carbon dioxide'. (see Fig 2)

*Fig 4. This image taken from a cadaver shows a view of a larynx with the oesophagus below. The oesophagus has a blanched lateral boarder appearing like an aryepiglottic fold and arytenoid plus an anterior boarder appearing like an epiglottis. Deep positioning of a laryngoscope blade could lead to an oesophageal intubation. (Image courtesy of Professor George Kovacs)*

## Human factors

When reviewing unrecognised oesophageal intubation reports, numerous examples appear involving errors of judgement, including confirmation bias of alternative diagnoses such as bronchospasm.[1] Other problems include fixation error, overconfidence by airway practitioners, or denial of oesophageal intubation.[5] These problems may be aggravated by a range of other adverse human factor behaviours, including poor team communication and hierarchy issues and making bystanders reluctant to speak up.[6] Refusal to check the tracheal tube by the primary practitioner has been reported, leading to critical delays in correct diagnosis and fatal consequences.[5]

To avoid distraction or denial of oesophageal intubation during this critical phase of airway management, a safety step involving a mini 'timeout' is recommended (see Fig 2). This pause should only take a few seconds, drawing attention to the capnograph immediately after every tracheal intubation, and take precedence over other activities that can be distracting.[9] After that, if the criteria for 'sustained exhaled carbon dioxide' are not met, remove the tube, and rely on oxygenation via a supraglottic device or face mask. If removing the tube is considered potentially dangerous and capnography is equivocal, the position of the tube can be confirmed by witnessed repeat (ideally video) laryngoscopy, in combination with flexible bronchoscopy, ultrasonography or use of an oesophageal detector device whenever feasible. (see Fig 3) [1]

## Conclusion

With the benefit of education, monitoring and a willingness to modify clinical practice, "oesophageal intubation" can be recognised and managed safely. Adoption of the recommendations outlined in this guideline has the potential to save lives.


## Acknowledgement

I thank and acknowledge Dr Nick Chrimes who reviewed this paper and Professor George Kovacs who provided the image seen in Figure 4 from the Dalhousie University's Human Body Donation Program. Used with permission.

# The dangerous airway – environmental, contextual and human factors influencing airway management


## Prof. George Kovacs

*Professor of Emergency Medicine*


There will be very little science presented in this talk as it represents lessons learned from being a parent, reflecting on success and failure and being humbled by life and clinical experiences. The 4 C's of success is a talk that grew around our kitchen table in discussing life with our four kids.

Educational institutions have focused evaluation of their learners around measuring competence. While competence is important it is not the desired outcome measurement in the real world. Performance is a patient focused outcome measure, while competence is learner focused and the two may not always be linked in the way we assume they are. There has been very little innovation in the delivery of medical education in the past 100 years. We transitioned from a mentor-based system, to one based on scientific fundamentals, to a problem-based approach, to the now common catch all term of 'competency based learning'. Time or numbers alone will never ensure competence. Naturally occurring clinical opportunities may not arise and simulation must fill this void particularly for high acuity low opportunity (HALO) procedures. Practice with timely feedback is the core of what has been termed deliberate practice.

While competence is important, competence without an appreciation for context will not lead to improved outcomes. This context is the basis for what we have come to know as human factors, those non-patient related environmental threats that pose as much a risk as the anatomically and physiologically compromised do in determining patient outcomes.

Confidence is the third 'C' and threatens patient and provider survival.

Lastly, conscientiousness is in my opinion the most critical determinant to being successful and preventing individual, team and patient outcome failure.

There are now 6 more Cs but I would bore you if I babble on so we will stick with the core 4 and maybe 2 bonus ones.

# Thinking fast and slow – why highly trained people still occasionally do the wrong thing


## Craig Webster

*Psychologist, The University of Auckland*


The division of human cognitive abilities into conscious and unconscious processes has been apparent to philosophers and psychologists for centuries, but recently this division has been popularised as thinking 'fast and slow' or dual process theory.[1] In dual process theory, unconscious processing is called system-1, and conscious processing is called system-2, with both systems operating in parallel and simultaneously. System-1 is fast, automatic, intuitive and largely relies on pattern recognition. In contrast, system-2 is slow, effortful, deliberative and associated with conscious reasoning. It is important to note that almost all cognitive tasks use some mixture of system-1 and system-2 processing. However, we are often unaware of this distinction because system-1 operates automatically or unconsciously. The disadvantages of system-1 include the fact that the conscious mind does not have access to its underlying mechanisms, often meaning that decisions and choices made by system-1 cannot be explained other than through claiming an intuition about something. The advantages of system-2 are that it can handle complex, novel problems and is able to offer rational explanations for decisions and choices. However, system-2 thinking is slow and effortful, making it unsuitable for many time-critical tasks. Our ability to introspect and explain the actions of system-2, but not of system-1, leads to the common misunderstanding that system-2 is less error prone than system-1, therefore making system-2 preferable for high-stakes decisions. In fact, both systems perform very well most of the time, meaning that the great majority of trained-for tasks result in good outcomes. However, both systems are capable of occasional errors, leading to incorrect decisions or actions.[2] In this talk I will consider the application of human factors in healthcare work environments in order to reduce this remaining risk of error, and the evidence for the effectiveness of this approach. Such an approach involves the redesign of error-prone aspects of work systems, does not involve exhortation, and typically does not involve more training.[3]


1. Kahneman D. Thinking, Fast and Slow. New York: Farrar, Straus, Giroux 2011.
2. Webster CS, Taylor S, Weller JM. Cognitive biases in diagnosis and decision making during anaesthesia and intensive care. *BJA Educ* 2021;21:420-25.
3. Schnittker R, Marshall S, Horberry T, et al. Human factors enablers and barriers for successful airway management - an in-depth interview study. *Anaesthesia* 2018;73:980-89.

# Awake intubation for anaesthesia and the emergency department

## Prof. Adam Law

Awake tracheal intubation (ATI) continues to be recommended when significant difficulty is predicted with airway management (1-3). ATI can be defined as tracheal intubation of patients who are maintaining their own gas exchange, airway patency and protection of the lower airway against the aspiration of foreign material during the process. ATI can be thought about in its component parts: patient selection (i.e., who needs it?), topical airway anaesthesia, use of adjunctive systemic medications and the awake intubation itself. Patient selection has been addressed in an earlier talk and its accompanying abstract.

Topical airway anaesthesia for ATI can be effectively applied in many ways. Blocks can also be used. Using more concentrated formulations of lignocaine will help with obtaining good conditions for ATI – e.g., 2% or higher. The DAS ATI guidelines (3) suggest a maximum dose of 9 mg/kg of lignocaine for ATI (importantly, based on lean body weight), but the least amount of drug consistent with good conditions should be used. For orotracheal ATI, I use a 3-step approach, beginning with direct application of 5% lignocaine ointment to the back of the tongue. The second step involves use of an atomizer to deliver lignocaine to the larynx and upper trachea. The atomizer, which delivers large droplets, is powered by 6-8 litres/minute of oxygen. I deliver three instillations orally, each timed with slow, deep patient inspirations, then allow a break. I do this series of 3 instillations twice more, during a total of 9 deep breaths. A third step involves use of Jackson crossover forceps to hold a lignocaine-soaked cotton swab in the piriform recesses, 45 seconds on each side. For the latter two steps, I use 3% lignocaine, concocted myself by mixing equal volumes of commercially available 2% and 4%. This 3-step regimen usually results in very good conditions.

Systemic medications should be judiciously used, and only with specific objectives in mind. Glycopyrrolate can be used to help dry the oropharyngeal mucosa; anxiolysis and sometimes amnesia can be obtained with benzodiazepines such as midazolam, and most importantly, low dose narcotics by bolus or infusion can help attenuate airway reflexes and reactivity to the passage of a bronchoscope and/or tracheal tube. I regard sedation, *per se,* to be a side effect of some of the foregoing medications, and not always a desirable one: having a relatively alert and compliant patient will help with application of topical airway anaesthesia.

Flexible bronchoscopy (FB) is most often used for ATI, although some clinical trials have compared use of hyperangulated blade videolaryngoscopy (VL) with FB for the purpose. These studies have generally concluded that *in their selected study populations*, first attempt success and failure rates are equivalent, but that VL-aided ATI takes less time (4). However, some large-scale retrospective database studies suggest that real-world success rates with VL-aided ATI may be lower than that facilitated by FB (5, 6). Furthermore, many of the most challenging difficult airway anatomic presentations will require a nasotracheal approach, leaving only the option of FB use. Thus, it is important to retain skills in the use of FB for ATI, meaning that the clinician should seek opportunities to use FB for the purpose, rather than avoiding it, to help maintain competence with the device.

Adverse events can occur during attempted ATI. These were recently studied and listed in a retrospective database study (6). Fortunately, the two most frequently occurring adverse issues are potentially preventable. The first related to cough and laryngeal reactivity during ATI (potentially preventable by use of an effective topical airway anaesthesia regimen) and the second was the need to change to a smaller or different endotracheal tube – again, potentially preventable, e.g., by ensleeving a relatively smaller sized tube over a relatively larger bronchoscope, thus minimizing any gap between the inner aspect of the tube and the outer aspect of the FB.

ATI in the operating theatre has very good published success rates – i.e., a 98-99% ultimate, and 84% first attempt success rate (5-8). However, these success rates may be challenged going forward, as the general use of ATI appears to be dropping (6), perhaps due to increasing use of, and confidence in videolaryngoscopy after the induction of general anaesthesia (my speculation only). In addition, there is wide variability in individual clinicians' use of the technique (5, 8): despite a similar practice profile, some clinicians may be reticent to use ATI, compared with their colleagues. In that ATI continues to be a necessary skill for some presentations of the difficult airway and/or dangerous patient physiology, causes of such reticence must be identified and addressed, and meanwhile, airway managers should be on the lookout for opportunities to perform ATI, to help with skills maintenance.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## Prof. George Kovacs

Awake tracheal intubation (ATI) in the emergency department is relatively uncommon occurring in approximately 4 in 1000 patients requiring intubation. This data from the NEAR registry reported two thirds of these cases are done because of upper airway pathology (angioedema, infection) with a success rate of 85%. 78% were performed with a flexible endoscope, of which a majority used a nasal route. Complications included a 10% incidence of non-critical hypoxemia and hypotension in 2.5%. As an uncommon event emergency physicians may have an opportunity to perform ATI once every several years. Skill acquisition and maintenance is therefore a challenge for this high acuity low opportunity event (HALO). Additionally, it is assumed that critically ill patients will be uncooperative and therefore when faced with an anticipated difficult airway, the provider may opt for what they are familiar with and perform an RSI with a double set-up front of neck airway.

The default approach for airway management of critically ill patients in the emergency department has been rapid sequence intubation. Registry datasets report first pass success rates of 85-95%. While these numbers are high compared to similar data from ICUs, the incidence of adverse events including critical hypoxemia ($SpO_2$<80%) and hypotension (SBP<65mmHg) is significant. Up to 3% of critically ill patients may suffer from a cardiac arrest in the post-intubation period. Some of these adverse events can be mitigated through adequate resuscitation before intubation is attempted. Aggressive pre-oxygenation, volume resuscitation, early initiation of pressors, induction dose reduction, ventilation and apnoeic oxygenation throughout the procedure will reduce adverse events. However, for some critically ill physiologically compromised patients, avoiding sedatives and allowing the patient to maintain spontaneous respiratory effort during an ATI may be the safest strategy. Additionally, this provides clinicians more experience in performing this otherwise rare procedure, potentially improving their chances for success when faced with an anatomically challenging case.

The term awake is perhaps a misnomer particularly for patients presenting in the ED. An awake intubation is one that is performed on a spontaneously breathing patient and facilitated primarily using topical anaesthetics. It can be performed successfully with little to no sedation even in critically ill patients. Ketamine is the agent most used to address the patient's ability to cooperate. It should not be used routinely and may paradoxically create more challenges in performing an ATI. Ketamine facilitated intubation has been described for decades and yet there remains little evidence to support this approach. It may have a niche role where an RSI is relatively contraindicated and a double set-up FONA will not rescue the patient's condition and an awake topical approach has either failed or is not possible. The concern with the resurgence of ketamine as a single agent for facilitating intubation is that it will become a dumping ground for those uncomfortable with performing an RSI and unskilled in performing an awake intubation. Sedation only intubation in general performs poorly when compared with RSI and ATI. A tool-box needs more than one tool to be useful at the jobsite. Get the tools, acquire, and maintain the skills to use them.

# Airway management in patients with COVID-19 – lessons learnt in India

**Prof. Sheila Myatra**
*Professor of Anaesthesiology and Critical Care Medicine*

# Current concepts in use of high flow nasal cannula for airway management

**Matthew Payton**
*Physicist, General Manager, Fisher and Paykel Healthcare*

During the last eight years, more than 300 papers have been published describing the use of Nasal High Flow (NHF) and THRIVE in anaesthesia. The objectives of this talk are to summarise current clinical evidence, describe the underlying mechanisms, to examine the limitations on the use of NHF, and to pose some of the many questions that remain unanswered.

There is evidence from published literature that NHF extends safe apnoea time during airway management, although further research is required in high BMI and critically patients. NHF has also been shown to reduce desaturations and procedure interruptions during procedural sedation. Emerging evidence suggests that NHF may have a role in reducing hospital length of stay, particularly in post-surgical cardio-thoracic patients.

Several mechanisms of action have been proposed including increased fraction of inspired oxygen, the generation of positive airway pressure, and the clearance of carbon dioxide. There is however still much to be learnt about these mechanisms, and particularly which apply during spontaneous breathing and those during apnoea. The clearance of carbon dioxide during prolonged apnoea is also controversial.

Potential adverse effects such as gastric insufflation and, in the context of the COVID-19 pandemic, the possibility of generating and/or spread aerosols will be discussed along with precautions to minimise the risk of fire.

Finally new technologies for delivering the therapy, and their limitations will be discussed.

# Laryngeal trauma – a case discussion on multidisciplinary airway management

**Mr David Vokes**

*Head and Neck Surgeon, Auckland City Hospital, Te Toka Tumati*

Laryngotracheal trauma (LTT) may be classified as either internal or external according to the mechanism of injury. While iatrogenic internal LTT is the most common type of LTT, however external LTT presents a challenging airway management scenario and is associated with a significant risk of mortality. Certain airway interventions such as neck extension, bag mask ventilation and supraglottic airway devices are not recommended in the management LTT, while other interventions such as cricothyroidotomy may be contraindicated. The options for airway management in LTT will be discussed and cases will be presented to generate discussion.

# Common causes of trouble – how to prevent or address them before they make it into morbidity studies


## Prof. Adam Law

*Professor of Anesthesia*


Airway-related morbidity continues to occur, even in the hands of trained and experienced airway managers. Postgraduate continuing education courses in airway management must continuously be updated to address recurring or new themes that are causing the trouble. By doing this, strategies for managing the issues, together with their prevention, can be advanced. To this end, as an airway course director, I regularly review the published literature for closed legal claim (1, 2) and morbidity studies (3) related to airway management. The content of such articles, together with coroners' and lay press reports about airway disasters help drive updates to course curriculum. In doing these reviews, it becomes evident that it is rarely the "weird and wonderful" that causes the trouble, so much as "garden variety" issues that could have been managed better. These latter issues continue to recur decade after decade, despite advances in airway equipment or the publication of updates to airway guideline recommendations. In the following few paragraphs, some of these top recurring themes are addressed.

Poor planning. Failure to perform a thorough pre-operative airway evaluation is a common theme, or, despite doing an adequate evaluation, not modifying the planned approach to securing the airway – especially, switching to use of an awake approach when significant difficulty is predicted. Deliberate consideration of whether an awake approach may be safer is especially important in the patient with obstructing upper airway pathology, other severe anatomic distortion of head or neck, or a history of neck radiation – all conditions that are over-represented in the airway morbidity studies. A second theme relating to planning is the failure to use video laryngoscopy (VL) for a first attempt when difficulty is predicted, yet airway management is planned after induction of general anaesthesia. Thus, although awake tracheal intubation may be a good solution to address predicted difficulty, if managing the airway after the induction of general anaesthesia, extra attention to the details of implementation should occur, including the first attempt use of VL, rather than DL. Obesity is another condition that is over-represented in airway morbidity studies, so that here again, careful evaluation and planning is warranted.

Perseveration and multiple attempts at the intended technique. Perseveration is defined as "the consistent application of any airway management technique or tool in three or more attempts without deviation or change, or the return to a technique or tool that was previously unsuccessful" (3). Perseveration is a common theme in reports of morbidity, often with multiple futile attempts at tracheal intubation facilitated by DL. It's problematic for many reasons, but perhaps the most concerning is that fixating on a single method can cause a loss of situational awareness, meaning that the clinician may overlook calling for help, thinking of a more effective device to address the anatomic constraints, or pausing to consider an effective exit strategy. Prevention of perseveration occurs through adhering to guideline-recommended limits of no more than three attempts at the intended technique before declaring failure and pausing to consider an exit strategy. Always calling for the help of another clinician after three unsuccessful attempts at the intended technique will also help interrupt perseveration with a single technique.

Failure to bridge with a supraglottic airway (SGA). In addition to their use as the intended airway management technique for many elective surgical procedures, SGAs can and should be used to bridge some difficult airway situations. First, an SGA should be considered in a failed intubation situation even when fallback FMV is non-problematic. Here, it can help buy some "hands-free" time for the clinician to think of

an effective exit strategy – and will help interrupt futile perseveration with further failed attempts at laryngoscopy. It may also provide a conduit through which to attempt flexible endoscopic-guided tracheal intubation. However, for the elective surgical case, if tracheal intubation had been the initial goal, proceeding with the case using the SGA might be unwise, so that an alternate exit strategy option should be engaged. Another "bridging" indication for placing an SGA is the failed intubation situation that coincides with difficult or impossible face mask ventilation – two elements of the "can't intubate, can't oxygenate" (CICO) situation.

Failure to recognize and declare a CICO situation and failure to perform timely eFONA. This is a perennial issue. Prevention of a poor outcome includes the recognition of when a CICO situation has occurred or is evolving. CICO can be defined as a failure of all three modes of ventilation (via endotracheal tube, face mask, or SGA ventilation), each tried on at least one optimized occasion, manifest by absent or severely attenuated waveform capnography, resulting in current or imminent hypoxemia. Alternatively, the Vortex cognitive aid calls for three attempts at each of the three modes of ventilation: if none succeeds, then eFONA should proceed, regardless of oxygen saturation. Once recognized, CICO should be declared to all present, so that everyone's efforts can be brought to bear on beginning emergency front of neck access (eFONA) as soon as possible. While equipment is being readied for eFONA, neuromuscular blockade (NMB) should be established or confirmed, and final attempts can occur at any ventilation pathway that has not yet occurred in an optimized fashion (e.g., FMV facilitated by NMB; or tracheal intubation facilitated by hyperangulated blade VL). Final attempts at ventilation should not, however, substantively delay the onset of eFONA. eFONA is a rare event, so that the clinician should learn a single technique, to remove the element of choice in a stressful situation, and "overlearn" it on part-task simulators, to help create "motor memory" which can be called upon in the heat of the moment.

Obvious as the management of the foregoing situations may seem to the airway manager who has thought about them, these are still the top issues causing patient morbidity and indeed, mortality. Regardless of their originating country or society, airway guidelines are very consistent in their recommendations to help prevent and address these situations. Reviewing the guidelines, thinking about their message, and ideally, practicing management of these scenarios in team-based simulation sessions will help avoid airway-related patient morbidity.


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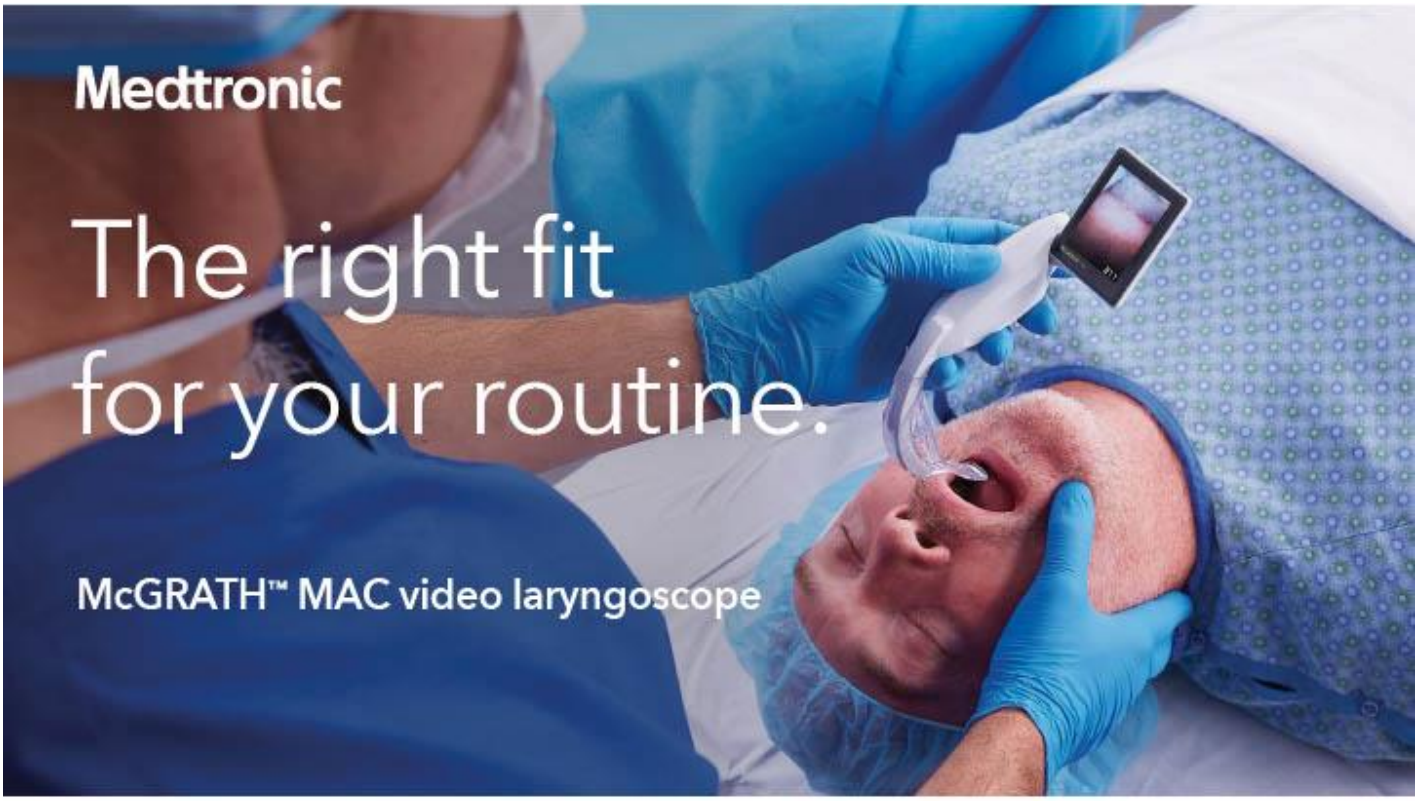


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[1]Kriege et al. Evaluation of the McGRATH™ MAC and Macintosh laryngoscope for tracheal intubation. Br J Anaesth. 2020; 125(1): e209laryngoscope
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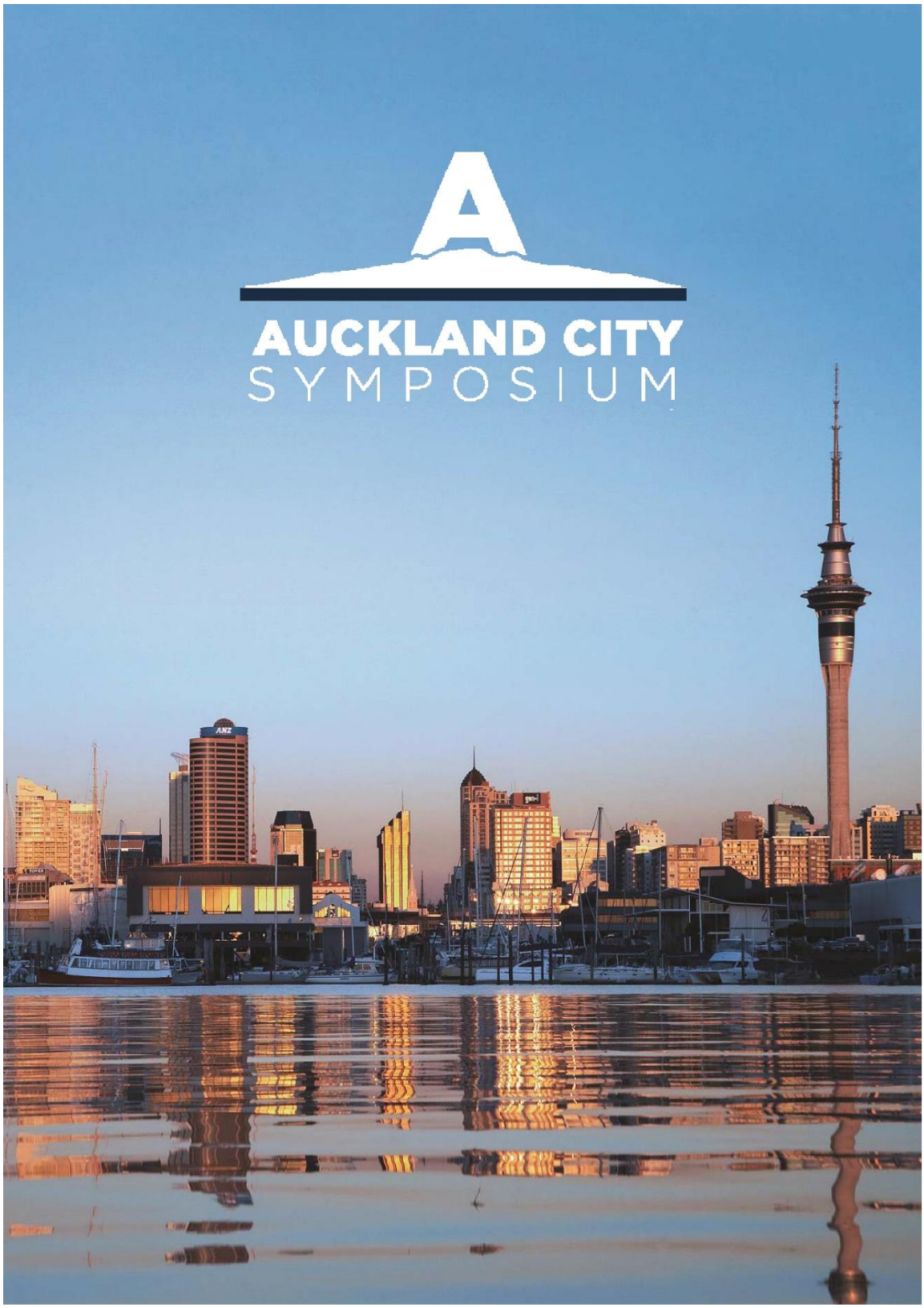
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