



Guideline for the management of evolving airway obstruction: transition to the Can't Intubate Can't Oxygenate airway emergency

Background paper

Introduction

The ANZCA Airway Management Working Group (AMWG) was convened in 2012 as the expert panel with the purpose of advising the Document Development Group (DDG) on developing ANZCA professional documents to guide practitioners in key aspects of airway management relevant to the can't intubate can't oxygenate (CICO) scenario. The transition from evolving airway obstruction to CICO was one topic in this series. The research required to produce this document and this background paper is contained in considerably more detail in the ANZCA document: *Report of the ANZCA AMWG - Airway Transition Management – 2014* (the AMWG Report).¹ The group aimed to present the best available evidence based on literature, or in areas where evidence was lacking, on consensus opinion. Group members worked in sub-groups of two to four to develop the report containing opinion, supported by evidence, and recommendations regarding the quality of management of transition from supraglottic rescue to infraglottic rescue in the 'can't intubate can't oxygenate' (CICO) event.

Context

This background paper (PS61 BP) reflects the executive summary of the AMWG Report described above. The professional document *PS61 Guidelines for the Management of Evolving Airway Obstruction: Transition to the Can't Intubate Can't Oxygenate Airway Emergency* generally aligns with the structure of the parts in the AMWG Report, as does this background paper.

Background

Can't intubate can't oxygenate (CICO) used in this document is failure to deliver oxygen as a result of airway obstruction that persists despite all reasonable supraglottic (rescue) airway management manoeuvres. CICO is an infrequently occurring event but one which the professional and lay communities expect to be prevented through good judgment, and when it does arise, to be capably managed by the airway proceduralist working effectively with his or her clinical team.

Infraglottic rescue is accepted as the appropriate management of the CICO event however there are concerns within the healthcare community that this infrequent event is managed sub-optimally. Various enabling and inhibiting factors have been suggested including both clinical issues such as ill-defined clinical criteria defining CICO, and human factors including organisational (systems) design, cognitive performance and team factors.

AMWG Report structure and key findings

A wide range of sources was reviewed in this report including systematic reviews, original research, audits, reports from adverse registries, coronial inquiries and opinion papers. With the exception of three systematic reviews² the information and advice presented in this series is based on Level C evidence.³

The evidence confirms that CICO is a rare event and implies that a larger volume of cases involving airway obstruction is managed with less serious outcomes however, there is evidence that CICO events are managed sub optimally.

This work is presented as a detailed report, containing cross referenced opinion papers (Parts 1 – 5) in addition to a summary and an introductory paper that presents the context, definition of terms and search methodology. Each of the five main parts presents an overview of evidence from the literature. This is synthesised into key points, representing the opinion of the authors, and includes recommendations for practice.

The focus of each part is as follows:

Introduction, definitions and methodology

Overview

Provides contextual information, defines the key terms used in the series and outlines the methods employed in the literature searches.

Part 1: Mortality and evidence of suboptimal care arising from CICO events

Overview

Reviews of the published literature for evidence of impact of CICO events on mortality and patient safety including evidence that the event is managed sub optimally.

Key findings

The literature provides evidence for several aspects of clinical practice that affect outcomes of CICO events, including:

- 1.1. *Identification of risk factors* for difficult intubation and difficult ventilation, such as infection, malignancy, trauma, congenital deformations and surgery involving the airway or neck and or other predictors that are identifiable on clinical examination during routine pre-operative assessment.
- 1.2. *Clinical judgement* regarding the decision on how to secure the airway e.g. by attempting intubation via laryngoscopy after induction of anaesthesia or sedation as opposed to using awake techniques, such as awake tracheostomy and awake fiberoptic intubation.
- 1.3. *Time delays* in initiation of or execution of infraglottic airway rescue, which often occurs in the context of repeated attempts at unsuccessful strategies such as laryngoscopy.
- 1.4. *Incomplete supraglottic rescue* revealed as neglect of potentially effective supraglottic rescue strategies related to bag mask ventilation; intubation (including optimal muscle relaxation) or insertion of supraglottic devices (SGD), for example Laryngeal Mask Airway (LMA).
- 1.5. *Practice variation* in respect to criteria for declaring CICO and subsequent procedural approaches to infraglottic rescue.
- 1.6. *Lack of preparation* in respect to knowledge of emergency algorithms, knowledge of equipment, and knowledge and rehearsal of procedural skills relevant to management of CICO.

- 1.7. *Cognitive and behavioural (human) factors* - in particular cognitive errors among teams of clinicians associated with task fixation, poor coordination and decision-making which may be compounded by inadequate assertiveness among nursing staff.

There is sufficient evidence to feel concerned that clinicians, including anaesthetists, other critical care clinicians and their teams, are not sufficiently prepared to prevent, recognise and or manage a CICO event.

Part 2: Clinical criteria for infraglottic rescue

Overview

Examines what, if any, clinical criteria support a decision to declare a CICO event prompting a shift in the focus of management from supraglottic to infraglottic rescue. The term Front of Neck Access (FONA) is gaining increasing use in the airway community. FONA typically refers to needle/cannula or scalpel/bougie techniques, but could also include direct surgical cut-down (e.g. by a surgeon).

Key findings

- 2.1. Several position papers, decision-support algorithms and cognitive aids have been published that provide guidance on the prevention and management of airway obstruction.
- 2.2. Close inspection reveals reasonably strong agreement that a CICO event should be declared in conjunction with failed supraglottic rescue - this includes manoeuvres related to bag mask ventilation, endotracheal intubation and ventilation via supraglottic rescue devices such as the laryngeal mask airway.
- 2.3. The papers differ in the extent to which they emphasise these three abovementioned groups of manoeuvres and in respect to whether and by how much they quantify a maximum number of attempts in relation to them. A range of two to four attempts is recommended for endotracheal intubation and up to two attempts for insertion of supraglottic airway devices. This series recommends no more than three attempts at endotracheal intubation and no more than two attempts at insertion of laryngeal mask airways, the most commonly used supraglottic airway devices within Australia and New Zealand.
- 2.4. Some guidelines recommend that oxygen should be delivered via a supraglottic route without interruption, where possible, and an exit strategy such as awakening the patient is observed. Some form of nasal prongs or cannulae may be useful and appropriate in providing continual oxygen delivery to the supraglottic region.
- 2.5. There is less guidance in respect to the significance of oxygen saturation and time. This series cautions that if not already evident, a fall in oxygenation is imminent when criteria for failed supraglottic rescue in the three pathways are met. It recommends that irrespective of oxygen saturation, clinicians should strongly consider calling for help after one pathway has been attempted unsuccessfully and should declare intent and mobilise resources for infraglottic rescue when two pathways are substantially unsuccessful. Concern should be upgraded if at any point oxygen saturation falls below 90%.
- 2.6. Recently published cognitive aids provide advice to mobilise resources for infraglottic rescue when two of the three abovementioned pathways are exhausted. This series adopts that same recommendation. It also notes that in practice clinicians may move

through these pathways in a non-sequential manner and at any point may have partially attempted one or more pathways.

Part 3: The role of Human Factors

Overview

Presents evidence that associates human factors with enablers and barriers to the prevention and management of CICO, including organisational (systems) safety, cognitive performance and team behaviours.

Key findings

- 3.1. Organisational, individual and team factors are strongly interrelated human factors that contribute substantially to prevention and management of airway emergencies including CICO.
- 3.2. Clinicians are vulnerable to errors resulting from unproductive cognitive processes or factors such as stress fatigue and high task workload that reduce cognitive resources and lead to errors. Clinicians should monitor their performance for these effects. Activation of pre-prepared responses and effective crisis behaviours should be employed to optimise these factors.
- 3.3. Teamwork is vital to ensure tasks are executed in a timely well-coordinated manner without errors. Team-members promote good performance by being knowledgeable of the practice guidelines, rehearsed in their execution, and prepared to support team leaders in an evolving emergency. This requires them to speak up if concerned. The behaviour of the team leader and culture within the team will enable or inhibit this. Team leaders should encourage other team members to speak up if concerned and this advice should be written into cognitive aids.
- 3.4. Finally, clinicians should practice in environments that are conducive to good performance. These include using evidence based locally relevant guidelines, resources, equipment and communications systems with which they have been trained. They should have access to other experts. Ideally they should train in teams but at a minimum should adhere to a common set of guidelines and procedures. The physical environment of the operating theatre or setting in which airway management occurs should be optimised to promote team coordination and situation awareness through display of cognitive aids, layout of relevant equipment, team leadership and effective emergency communication, the latter including briefings and updates and closed loop communication.

Part 4: Management of Transition

Overview

Looks at the evidence from Parts 1, 2 and 3 recommends strategies contributing to minimisation or mitigation of CICO. The importance of a human factors approach to 'declaration of failure' and recognition of barriers present in a clinical environment has been emphasised.⁴

Key points

- 4.1. In order for clinicians to be prepared for this event multiple performance shaping factors must be optimised.

- 4.2. The event should be prevented where possible through vigilant assessment and monitoring of patients who are at risk of CICO. This involves a timely decision to secure the airway, avoiding general anaesthesia unless risk of CICO is mitigated and a conservative approach to extubation. It goes without saying that clinicians should have advanced training and experience in supraglottic airway management, in respect to bag mask ventilation, endotracheal intubation and supraglottic rescue devices such as the laryngeal mask airway, before they sedate patients at risk of airway obstruction.
- 4.3. There must be some criteria, practice guidelines or standards that support clinicians' decision-making regarding declaring CICO and initiating infraglottic rescue (FONA).
- 4.4. Clinicians and their teams should be trained and adequately rehearsed regarding the use of these tools, the practical procedures entailed in infraglottic rescue and the equipment they will use, in their setting. Response to a potentially evolving CICO event will then largely be a matter of activation of pre-rehearsed strategies.
- 4.5. Clinicians should be aware of cognitive, team and organisational factors that influence performance and have the ability to optimise these (See Part 3).

Part 5: Features of cognitive aids that best support the management of CICO

Overview

Evaluates the evidence for the routine use of cognitive aids (CAs) in CICO events and their design features.

Key points

- 5.1. Several position papers, decision-support algorithms and cognitive aids have been published that provide guidance on the transition from supraglottic rescue to infraglottic rescue in airway emergencies. However, not all of these specify whether their intended use is to guide training and rehearsal conducted in preparation of an emergency; to guide decision-making and performance during an airway emergency; or some other purpose such as standard setting and or quality assurance activities. It is unlikely that a guideline, presented in a single format, could achieve all of these purposes. In particular, content rich documents that are effective as training guides are not well suited to be used in real-time to support decision-making or prevent common errors such as memory failure, communication errors and assertiveness issues.
- 5.2. There is a role for simple cognitive aids whose purpose is to be used at the bedside to remind people of the more detailed decision-aids they have used in training activities, prompt users to follow best practice at high risk points and prevent key performance errors during an evolving emergency.
- 5.3. There is strong support for the routine use of CAs in the management of anticipated and unanticipated difficult airway scenarios. Appendix 1 of PS 61 provides an example of a CA designed to support airway management in evolving airway obstruction up to the point a CICO is declared.
- 5.4. Alternatively, facilities may develop CAs that are contextually matched to local practices. Drawing from evidence presented in this series the key recommended features and inclusions of a cognitive aid for CICO are listed below. The aid should:
 - 5.3.1. Be simple visual aids designed to support memory recall, prompt users regarding frequently omitted steps or clarify difficult decision points. In this

sense they are distinguished from more detailed decision-support aids that are intended to be used to support training and development of local policies.

- 5.3.2. Be easily accessible to all members of the team and embedded in everyday routine practice, such as case briefings.
- 5.3.3. Show airway assessment, decision to induce general anaesthesia and CICO to emphasise these are co-dependent milestones and events.
- 5.3.4. Emphasise supraglottic rescue and express this as three pathways or categories: Bag mask ventilation, endotracheal intubation and supraglottic rescue devices.
- 5.3.5. Suggest clinical criteria for declaring CICO e.g. max number of attempts at endotracheal intubation and SaO₂
- 5.3.6. Include prompts (as questions, reminders or practice points) for steps at high risk of faulty decisions, omission or delay.

Several useful aids have been recently published that address some of these points. It may also be beneficial for developers or users of content rich guidelines to adapt these into simple cognitive aids using the above advice.

References

1. ANZCA Document: Report of the ANZCA AMWG - Airway Transition Management – 2014 <http://www.anzca.edu.au/resources/college-publications>
2. Law JA Broemling N Cooper RM et al. (2013). The difficult airway with recommendations for management--part 1--difficult tracheal intubation encountered in an unconscious/induced patient. *Can J Anaesth*, 60(11), 1089-1118. doi: 10.1007/s12630-013-0019-3
3. Guyatt G, G. D., Baumann MH, et al. G (2006). Grading strength of recommendations and quality of evidence in clinical guidelines: report from an American College of Chest Physicians Task Force. *Chest* 129, 174-181.
4. Marshall, S. D. and J. J. Pandit (2015). "Radical evolution: the 2015 Difficult Airway Society guidelines for managing unanticipated difficult or failed tracheal intubation." *Anaesthesia*. Epub ahead of print.

Related ANZCA documents

PS61 Guidelines for the Management of Evolving Airway Obstruction: Transition to the Can't Intubate Can't Oxygenate Airway Emergency

PS56 Guidelines on Equipment to Manage a Difficult Airway During Anaesthesia

ANZCA CPD Program - Appendix 12: Standards for Can't Intubate Can't Oxygenate (CICO) education sessions http://www.anzca.edu.au/fellows/continuing-professional-development/pdfs/Appendix_12_CICO_Standard_131210.pdf Accessed 18 May 2015.

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