



Short title: CICO

1. Scope and purpose

This document summarises the available information and evidence relating to airway obstruction evolving to a 'Can't Intubate, Can't Oxygenate (CICO)' situation. It includes strategies to prevent and identify the event and then manage the decision to transition to infraglottic rescue. Guidelines for the practical management of infraglottic rescue itself in a declared CICO situation are available from a number of sources. Appendix 1 presents an example of a cognitive aid relevant to the transition period leading to declaration of a CICO.

2. Definitions

2.1 *Can't intubate can't oxygenate (CICO)* is failure to deliver oxygen as a result of upper airway obstruction (at or above the immediate subglottic region) which persists despite all reasonable airway rescue manoeuvres at or above this level, termed 'supraglottic rescue' in this document. This implies that persistent attempts at supraglottic rescue are unlikely to succeed and that the obstruction may potentially be bypassed by accessing the airway via the trachea in the infraglottic region across the anterior aspect of the neck. While it is recognised that CICO may alternatively be caused by obstruction in the mid trachea and that low oxygen states may be compounded by obstruction in the lower trachea or lungs this paper will not explicitly address these events.

2.2 *Transition* is the phase of care leading up to, and including, a committed declaration of a CICO event. Transition has an ill-defined beginning - upper airway obstruction is evident and not resolved by initial attempts at supraglottic airway management. As the majority of these cases will be successfully managed by supraglottic rescue and or awakening the patient we assume transition infrequently involves an actual declaration of CICO but always involves a justifiable concern of an impending CICO. In that instance it also includes the decision to shift the focus of the resuscitation from supraglottic rescue to infraglottic rescue.

3. Summary of key steps in the transition to CICO

The following steps are recommended:

- 3.1 Prevent airway obstruction through careful pre-anaesthesia assessment. Consider regional anaesthesia, awake intubation or awake tracheostomy in high risk patients. Be prepared to manage airway obstruction in all patients including low risk patients. Use specific criteria to guide extubation and monitor carefully afterwards.
- 3.2 If airway obstruction occurs attempt one or all of the following three supraglottic rescue pathways until the obstruction is overcome:
 - Bag Mask Ventilation (BMV)
 - Insertion of a supraglottic device (SGD), including the Laryngeal Mask Airway (LMA)
 - Endotracheal Intubation (ETT).

- 3.3 Attempt to deliver oxygen continuously via face mask, nasal prongs or a SGD.
- 3.4 If airway manoeuvres in **one pathway** are substantially attempted without success then escalate the emergency response with the following:
- Call for skilled assistance from anaesthetic colleagues, surgeons, other critical care clinicians and or nursing colleagues.
 - Consider awakening the patient, if feasible
 - Note the time, verbalise concerns if present, and encourage others to speak up at any time if concerned.
- 3.5 If airway manoeuvres in **two pathways** are substantially attempted without success then escalate the emergency response with the following:
- Mobilise resources for infraglottic rescue including briefing the team.
- 3.6 If airway manoeuvres in **three pathways** are substantially attempted without success then escalate the emergency response with the following:
- Declare CICO verbally and initiate infraglottic rescue immediately using a Front of Neck Access (FONA) technique (for example scalpel/bougie, needle/cannula).

4. Clinical criteria supporting a decision to declare CICO and initiate infraglottic rescue

- 4.1 A CICO event is declared in conjunction with all of the following: unsuccessful endotracheal intubation, unsuccessful bag mask ventilation and unsuccessful oxygenation via supraglottic devices such as the LMA in the context of imminently falling or persistently low oxygenation.
- 4.2 In general, attempts at any of the three pathways should include optimization of head position, consideration of muscle relaxation and skilful assistance.
- 4.3 Bag mask oxygenation should be declared unsuccessful after several additional airway manoeuvres have been attempted including two-handed, two-operator technique, insertion of oro- and/or naso-pharyngeal airways and inspection of the oropharynx to remove foreign bodies.
- 4.4 Oxygenation via supraglottic devices should be declared unsuccessful when two attempts have been made with different sizes or types of devices.
- 4.5 Endotracheal intubation should be declared unsuccessful when three optimised intubation attempts are unsuccessful, including, for example, varying the type and size of laryngoscope in direct laryngoscopy; videolaryngoscopy and in some circumstances bronchoscope-guided intubation via a SGD. Intubation may be declared unsuccessful with fewer than three attempts under certain circumstances if reasonable evidence suggests further attempts will be counterproductive to supraglottic rescue by either bag mask ventilation or supraglottic device.
- 4.6 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.
- 4.7 If not already evident, a fall in oxygenation is imminent when criteria for failed supraglottic rescue in the three pathways are met. Thus, 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%.

5. Background evidence

5.1 Morbidity and mortality

CICO is a rare event occurring in approximately 1:10,000 to 1:50,000 of routine general anaesthetics although some evidence suggests it may be up to ten times more frequent in settings outside of the operating theatre such as intensive care and the emergency department. The incidence of CICO is very low compared with the incidence of difficult intubation suggesting that anaesthetists and other clinicians largely prevent or successfully manage evolving airway obstruction. This is an imperative given the very high mortality and morbidity associated with CICO.

However, available evidence addressing “organisational safety” and “human factors” suggests that lack of preparedness at organisational, team and individual levels is widespread.

5.2 The role of human factors

Human factors, including avoiding organisational and cognitive errors and using effective teamwork play key roles in the prevention, evolution and management of CICO events.

5.2.1 Organisational errors

CICO events may potentially be avoided by robust multifaceted institutional safety programs aimed at reducing risks, early identification and rectification of errors and rapid recovery from adverse events. Components of these programs include, as examples: airway registries, early warning or alert systems, multidisciplinary care of at-risk patients, standardised practices and equipment, adherence to best practice guidelines, routine use of checklists, regular training that is matched to decision-support tools, quality assurance data collection, and reporting of adverse events. Safety programs also promote a culture of safety among staff, particularly emphasising the importance of good teamwork and open assertive communication.

5.2.2 Cognitive errors

Equally important is the acknowledgement that cognitive errors increase under emergency conditions, largely as a result of task loading and sensory overload. The following strategies are likely to be effective in an evolving airway emergency:

- Use of cognitive aids (CA) that use simplified content and symbols to remind people of the more detailed decision-aids they have used in training activities. These should prompt the whole team to activate pre-rehearsed practices aimed at identifying evolving problems and methodically working through them and to follow best practice at high risk points (See Appendix 1).
- Self-awareness by clinicians of their vulnerability to errors, and self-monitoring to detect and rectify errors, unproductive cognitive processes, or factors such as stress fatigue and high task workload that reduce cognitive resources and lead to errors.
- Encouragement of other team members to speak up to provide input or raise concerns where these exist.
- Real-time optimisation of the physical environment to promote situation awareness.

5.2.3 Team behaviours

Effective teamwork improves clinical performance measured as improved situation awareness, decision time, task management and task completion time. Poor situation

awareness is strongly associated with other cognitive errors. Effective team attributes and behaviours include: shared mental models, role clarity, high co-ordination, clear supportive communication, strong leadership, rapid logical decision-making and regular monitoring and review.

5.3 Prevention of CICO prior to initiation of airway management

The following practices are recommended to optimise individual, team and organisational performance before airway management is initiated:

5.3.1 Be prepared to respond

- Institute locally relevant, multifaceted safety programs which include registries of at-risk patients, best practice guidelines (for training) and cognitive aids (to support real-time practice), standardised equipment that matches the guidelines and cognitive aids, rosters and communication processes that mobilise multidisciplinary specialist care, and incident reporting and audit.
- Ensure clinicians and teams undergo routine training that is contextualised relevant to setting and which includes: emergency planning, application of practice guidelines and cognitive aids, airway ‘time-outs’, team roles, procedural skills and use of equipment.

5.3.2 Prevent CICO

- CICO should be prevented, where possible, by thorough pre-anaesthesia assessment, which informs the development of primary, backup and emergency plans for airway management. In high risk patients the primary plan should include the consideration of the option for an awake technique such as awake fiberoptic bronchoscopy or awake tracheostomy; the back-up plan features one or more of a range of supraglottic rescue techniques and the emergency plan involves pre-rehearsed procedure(s) for infraglottic rescue.

5.4 Management strategies during evolving airway obstruction

The following practice points are recommended to optimise individual, team and organisational performance during evolving airway emergencies, and in declared CICO events:

5.4.1 Manage ambiguity

- Be guided by specific clinical criteria when declaring CICO
- Seek input from colleagues in decision-making
- Use a cognitive aid that reminds people of the more detailed decision-aids they have used in training activities, prompts users to follow best practice at high risk points, and prevents key performance errors.

5.4.2 Prevent and detect cognitive failure

- Use a cognitive aid which is available to all members of the team.
- Activate pre-rehearsed emergency responses and problem-solving practices

- Be self-aware of vulnerability to errors and self-monitor to detect and rectify errors or unproductive cognitive processes that lead to fixation errors or that reduce cognitive resources
- Manage stress
- Invite team members to provide input and raise concerns
- Optimise the physical environment to promote situation awareness.

5.4.3 *Optimise team support and communication*

- Use cognitive aids which are available to all members of the team.
- Activate pre-rehearsed team practices to optimise co-ordination, communication and situation awareness
- Share information using effective language such as: team briefing, closed loop communication and status update reports
- Invite team members to provide input and raise concerns.

5.4.4 *Monitor attention and minimise delays*

- Mobilise resources early
- Break key tasks into steps such as separating infraglottic rescue into (1) trans-tracheal access and (2) emergency oxygenation
- Use cognitive aids to prompt progress at points at risk of delay.

6. Summary

The key factors which need to be considered, and the key actions to be taken in the developing critical airway obstruction scenario, are outlined in the **Transition to CICO Cognitive Aid** in Appendix 1. As noted, it is designed to be well known beforehand so that in a critical situation it will re-enforce and help to structure use of prior knowledge, and most importantly assist with timely identification of the need to transition to the surgical airway.

This document is accompanied by a background paper (PG61(A)BP) which provides more detailed information regarding the rationale and interpretation of the Guideline.

Related ANZCA documents

Australian and New Zealand College of Anaesthetists. PG56(A) Guideline on equipment to manage difficult airways. 2021. Available from:
[https://www.anzca.edu.au/getContentAsset/6db226ca-30fc-4267-b7e2-b58a2d83830c/80feb437-d24d-46b8-a858-4a2a28b9b970/PG56\(A\)-Guideline-on-equipment-to-manage-difficult-airways-2021.PDF?language=en](https://www.anzca.edu.au/getContentAsset/6db226ca-30fc-4267-b7e2-b58a2d83830c/80feb437-d24d-46b8-a858-4a2a28b9b970/PG56(A)-Guideline-on-equipment-to-manage-difficult-airways-2021.PDF?language=en) Accessed 21 May 2024.

ANZCA and FPM CPD Program. Can't Intubate Can't Oxygenate (CICO) Emergency Response (ER) sessions. 2023. Available from: <https://www.anzca.edu.au/getContentAsset/53d42b20-0f0e-4ec9-9172-004d9b1a158f/80feb437-d24d-46b8-a858-4a2a28b9b970/ANZCA-FPM-CPD-CICO-ER-session-guideline.pdf>. Accessed 21 May 2024.

References

Report from the ANZCA Airway Management Working Group (AMWG). Transition from supraglottic to infraglottic rescue in the “can't intubate can't oxygenate” (CICO) scenario. Available from: <https://www.anzca.edu.au/getContentAsset/5958ee94-d28f-4356-8dd0-0ac7e32bf64b/80feb437-d24d-46b8-a858-4a2a28b9b970/Report-from-the-ANZCA-Airway-Management-Working-Group-final.pdf> Accessed 21 May 2024.

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