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## Critical airways, critical language

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The contribution of human factors to adverse outcomes during emergency airway management is well established.<sup>1</sup> Effective communication is a core non-technical skill that contributes to minimizing such error.<sup>2</sup> The language used must aid rather than hinder communication.

The term ‘critical language’ refers to standardized communication in which specific terms or phrases have a clear, mutually agreed meaning.<sup>3–4</sup> It is employed in healthcare and other high reliability industries to avoid ambiguity, flatten hierarchies and improve team situation awareness.<sup>3–6</sup> Its use has typically involved phrases invoking a halt to activity and a mandate to consider any party’s concerns,<sup>3–5</sup> but the concept can be extended to include any standardized language that improves clarity of communication and reduces teamwork errors by facilitating a shared mental model. Critical language used in emergency settings should be precisely defined, consistently used, memorable, easy to articulate and readily understood by all team members. Ideally it should not only improve clarity of communication but also trigger cognitive links to key priorities and actions required. Phrases including ‘cardiac arrest’, ‘no output’, ‘shockable rhythm’ and ‘stand clear’ are examples of de facto critical language that are embedded in cardiac arrest management and familiar to most clinicians. In contrast, such consistent clear vocabulary has not developed in emergency airway management, which is encumbered with multiple terms and a lack of definitions for many essential concepts, devices and procedures. This creates the preconditions for confusion and misunderstanding between team members with the potential to impair performance, particularly in a crisis setting. Here, we describe specific areas of concern and discuss the need to consolidate these terms to create a universally accepted lexicon for airway management.

### Communicating ‘can’t intubate, can’t oxygenate’

The can’t intubate, can’t oxygenate (CICO) situation occurs when ‘oxygenation’ cannot be achieved using the anatomical conduits of the upper airway. The shift to CICO from the previous ‘can’t intubate, can’t ventilate (CICV) terminology, initiated by Heard,<sup>7</sup> has been applauded for creating a focus on the priority of

maintaining patient oxygenation. The expectation is that this could diminish fixation on tracheal intubation and attempting to establish normal minute ventilation, which is known to have jeopardized oxygen delivery and contributed to adverse airway outcomes.<sup>1–8</sup> Adoption of the term CICO has not been universal, however, and it is conceivable that the co-existence of the similar terms CICV and CICO to describe the same situation could lead some clinicians to wrongly conclude that they are intended to distinguish between slightly different circumstances. If a declaration of CICV is not understood to be synonymous with one of CICO, this could compromise team situation awareness that the trigger for abandoning attempts at the upper airway techniques of face mask, supraglottic airway and tracheal intubation has been reached. The move from ‘ventilate’ to ‘oxygenate’ has also introduced some issues that affect the potential utility of the new term as a form of critical language for emergency airway management.

Firstly, it has impacted on the abbreviated forms, converting the initialism CICV (which must be spelt out when verbalized) into the acronym CICO (which can be spoken as a word). This alteration is a double-edged sword: on one hand, the CICO acronym creates a distinct term that can be easily verbalized during a crisis. In addition to facilitating team situation awareness, this has the potential to generate a ‘brand’ that not only helps promote CICO itself, but link it to related concepts such as CICO training, CICO kit, CICO pathway,<sup>9</sup> CICO status<sup>10</sup> and CICO rescue.<sup>10</sup> On the other hand, however, the acronym converts the descriptive phrase ‘can’t intubate, can’t oxygenate’ into an incomprehensible neologism. This creates the potentially dangerous situation of having a term that may not be understood by all clinicians in a team. This risk is likely to vary with geography, institution and discipline, according to the cultural tendency to use the abbreviated form—indeed we have observed differences between Australia (where the spoken abbreviation is commonplace) and the UK (where voicing the abbreviation is not the norm). Even in environments where the abbreviated form is in common use, a lack of consistency in how it is verbalized may still lead to confusion. Variations include ky-koh, kic-koh, seekoh, cheek-koh, sic-koh, psy-koh and spelling out C-I-C-O. While this diversity may seem comical, the lack of standardization in a

key term for emergency management is concerning. It is foreseeable, particularly under stress, that one pronunciation may not be recognized and understood by unfamiliar team members, producing a critical failure in communication. Heard,<sup>7</sup> who coined the CICO acronym, has endorsed ky-koh (a common variation in Australia) as the pronunciation (A.M.B. Heard, personal communication, 2016), so it seems reasonable that this should be adopted as the standard.

A less obvious but potentially more serious deficit with CICO is the lack of consensus on what is meant by 'oxygenation' and consequently what 'can't oxygenate' means. Oxygenation could refer to oxygen delivery to the alveoli, blood or tissues, with an inability to achieve each of these being, respectively, identified by absence of an end-tidal carbon dioxide trace, oxygen desaturation and bradycardia/arrhythmia. Even the term 'alveolar oxygenation' could imply either the physiological state of maintained high oxygen concentration in the alveoli (which following preoxygenation does not require ongoing airway patency) or the process of delivering fresh oxygen to the alveoli (which demands a patent airway). Depending on the interpretation of 'oxygenation' adopted, significant disparities in the trigger for declaring CICO are possible (and logical) and could result in differences of several minutes before rescue techniques are initiated. While a discussion of which of the above triggers is most appropriate is beyond the scope of this article, this sort of discrepancy is undesirable in a time-critical situation, such as insurmountable upper airway obstruction, where only a few minutes may separate complete recovery from permanent neurological injury.

In a situation that is already psychologically and technically challenging, an ill-defined trigger potentially adds a cognitive barrier to initiating rescue interventions. The corollary of the above is potential confusion over when a 'can oxygenate' situation exists, with a resultant failure to properly exploit the opportunities this presents. To ensure consistent understanding of what constitutes a CICO situation and when to institute rescue procedures, consensus must be reached on the precise meaning of the term oxygenation and thus how to determine whether this is being achieved. The Vortex Approach<sup>10</sup> attempts to address these ambiguities by encouraging a declaration of whether the situation is 'in the Green Zone' (i.e. there is 'confirmation of adequate alveolar oxygen delivery') or 'in the Vortex' (i.e. where this fails), enabling clinicians to concisely articulate to their team a clear dichotomous relationship between two contexts with distinct priorities and opportunities. Whether these terms can become widely accepted 'critical language' remains to be seen.

## Terminology for airway rescue

Declaration of a CICO event represents the trigger for initiating urgent restoration of airway patency by creating a passage for oxygen delivery between the anterior neck and the trachea. However, each of the major guidelines and other authors have tended to adopt varied and often idiosyncratic terms for this procedure.<sup>7 10-18</sup> This lack of consistent terminology is another potential impediment to prompt management of CICO events. Consider the situation in which a stressed clinician, having recognized and declared a CICO situation, requests the 'emergency surgical airway' kit as the patient's oxygen saturations decrease. Their assistant searches for, but cannot identify, the required equipment, which is labelled 'invasive airway access' or 'front of neck access' or 'percutaneous emergency oxygenation' or 'cric' or 'tracheostomy', etc. Under

extreme psychological pressure, the connection between these divergent terms, which might seem obvious to the unstressed clinician, may not be made. The authors (Chrimmes & Cook) are aware of CICO emergencies in which discrepancies between the terminology understood by different clinicians in a team vs that used to label equipment and storage locations have caused confusion and delays in management.

Table 1 provides a (non-exhaustive) sample of terms used to describe the rescue interventions required during a CICO event. The merits and disadvantages of each of these as terms for use in an emergency situation are best understood by considering some of the desirable features of such a term.

1. Simple. The term should be simple enough to be recalled and articulated by stressed clinicians and understood by those assisting. Polysyllabic, complex or highly technical terms are undesirable. Many of the terms in Table 1 are burdened by this issue as medical terminology has tended towards technical vocabulary without considering the impact of this on communication and teamwork in an emergency.
2. Intuitive. The term should ideally be able to be understood by all clinicians including those without prior exposure. This is facilitated by terms that are familiar, descriptive and accurate. As discussed above, this element may be compromised by the reduction of some otherwise descriptive terms to unfamiliar acronyms.
3. Precise. The term should be specific to techniques for emergency restoration of alveolar oxygen delivery during a CICO situation. This includes ensuring the term is distinct both from non-airway interventions and from non-emergent surgical tracheostomy, which is inappropriately time-consuming during CICO situations. Such ambiguity is known to have contributed to adverse outcomes during airway emergencies, particularly when surgical colleagues have been invited to perform airway rescue via the front of the neck during CICO situations.<sup>16</sup> Adding the prefix 'emergency' to non-emergent techniques (e.g. emergency surgical airway) effectively distinguishes them from one another but this distinction risks being lost if the prefix is dropped to enable concise communication in a crisis. Although technical terminology is typically precise, this advantage is offset by a negative impact on simplicity and the intuitive nature of the term, as not all technical terms are understood equally by all healthcare professionals. For example, the term 'infraglottic' rescue<sup>14</sup> (Table 1) is technically precise but is unlikely to be widely recognized. The challenge is achieving precision while preserving clarity and conciseness.
4. Inclusive. The term should be inclusive of all techniques appropriate to a CICO emergency, irrespective of the equipment used (cannula or scalpel) or anatomical site (cricothyroid membrane or trachea).
5. Non-intimidating. The term itself should not pose a psychological barrier to action. Again, technical terms have the potential to be intimidating by implying the requirement for highly specialized (e.g. 'surgical') skills.
6. Established. Ideally terminology in common clinical use should be used. Coining of new terms should only be undertaken where the existing terminology has significant deficits and the benefits of addressing them outweighs the downsides of introducing another term. Unfortunately, the commonly used term 'surgical airway' is undesirable according to several of the above criteria for being imprecise, non-inclusive, intimidating and perhaps not intuitive.

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