How Can We Manage The Can't Intubate, Can't Oxygenate (CICO) Crisis Better?

A Multidisciplinary Team Training Course Incorporating A Human And Systems Factors Approach

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Abstract

AIM: *To report on a multidisciplinary CICO crisis management course.*

BACKGROUND: *CICO is an infrequent, life-threatening event that is often sub-optimally managed. Failures in decision-making, algorithm use, team resource management and institutional preparedness have been reported. Human and system design factors appear to contribute as significantly as procedural ability to failures in CICO crisis management and have been highlighted as areas of unmet training needs.*

METHODS: *A working party constituting members with expertise in education, simulation and difficult airway management designed a one-day course comprising interactive lectures, case discussions, practical workstations and team-based simulated scenarios. Sessions integrating technical, human and system factors aimed to improve clinicians' ability to recognise a CICO situation, appropriately commit to a cricothyroid approach and execute this successfully. Rehearsal of a reliable procedural algorithm, team practice of supportive roles (including speaking-up) and a workplace audit addressing systems readiness were emphasised. To enable the course to be mobile we adapted exiting 'wet-lab' methods using ex-vivo sheep larynx task trainers. Evaluation was by course survey.*

RESULTS: *The course was piloted for a multidisciplinary group of 30 nurses and consultants from a regional hospital's critical care and surgical departments. Participants value rehearsal of anterior neck procedures and the CICO algorithm. Sessions on team culture, support and speaking up suggest teams also value practical rehearsal of non-technical skills.*

CONCLUSION: *With some modifications, this course could compliment existing training on CICO crisis management and the systems audit would assist in enabling local quality assurance.*

Background and Aims

BACKGROUND

Clinical human factors includes aspects of organisational culture, job factors as well as human characteristics (including individual, team and managerial characteristics) that *influence healthcare staff behaviour in relation to safe patient care*. These human factors can be modified to improve safety in healthcare generally and in crisis management specifically.

Figure 1. The cause of the world's worst air disaster in 1977 at Tenerife (digitally recreated above[5]) can be appreciated by understanding how humans interact with each other in demanding situations. In this incident, the steep authority gradient between the cockpit's crew and a reluctance to question the pilot contributed to the death of 583 people[6]. A similar dynamic contributed to the death of Elaine Bromiley following a CICO crisis during routine surgery[7].

Crisis management training has long been used in high-risk industries such as aviation and nuclear power, which have recognised the contributory role of human and system factors in major disasters. This wider understanding of accident causation underlies the principles of *designing safer systems* and providing adequate *crisis management training*.

By comparison, introduction of human factors concepts in accident causation in healthcare is a new event.

Australian health system design and staff training may benefit substantially from the introduction of these concepts as research demonstrates that a significant number of preventable[1] adverse events occur in Australian healthcare.

Human and system design factors also appear to contribute as significantly as procedural ability to failures in CICO crisis management [2-4] highlighting these issues as areas of unmet training needs. The 4th National Audit Project of the Royal Society of Anaesthetists and the Difficult Airway Society[2] (NAP4) identified a number of elements contributing to significant failure rates associated with emergency cricothyroidotomies performed during CICO crisis. These elements included:

- **Poor planning**
- **Deviations from recognised algorithms, and**
- **Failures of technical skills and human behaviour**

AIM

The aim of this work is to describe a multidisciplinary team-training course incorporating human and systems factors into CICO crisis management training and it's impact on the staff and institution where it has been piloted.

Materials and Methods

The workshop was designed as a one day course targeted specifically at senior members of medical and nursing teams from a variety of disciplines including anaesthesia, intensive care, surgery and emergency medicine. These being the teams that would most likely encounter or be called to assist in the management of a critically obstructed airway.

A working party constituting members with expertise in education, simulation and difficult airway management designed the course. The course was designed based on:

- **Training needs identified from literature relating to CICO crisis management**
- **Clinical human factors relevant to preparing the individual and their teams to manage the CICO crisis**
- **The need to prepare the institution to design systems to manage this event**

Materials developed to assist the course included:

1. A CICO crisis management guideline utilising a previously published reliable procedural algorithm[8] and incorporating team role allocation with a clinical decision-making pathway (Fig.2)
2. A workplace audit to assess an institution's readiness to manage the CICO crisis (see Further Information)
3. Ex-vivo sheep larynx task trainers for procedural training
4. Lecture content relating to both technical / procedural and non technical aspects of CICO crisis management
5. Immersive team-based simulation scenarios

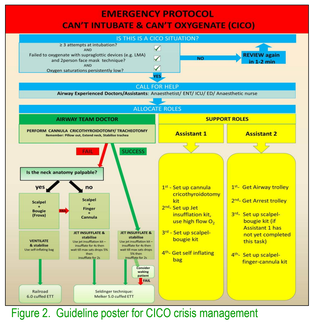

Figure 2. Guideline poster for CICO crisis management

Figure 3. Practical skill team training using sheep larynx task trainers.

The course consisted of three parts:

- Clinical decision-making: didactic lectures and case discussions introduced the CICO problem and were aimed at recognising the CICO crisis, explaining the CICO algorithm and oxygenation strategies.
- Practical team-training workshop: each participant formed a *nurse-doctor team* with members from their own department. Teams trained together, practicing a number of CICO airway rescue techniques which they were taught (Fig.3).
- Human and system factors relevant to CICO crisis management.: discussions and lectures addressed issues of human factors, systems design, preparedness to act, assertiveness and communication.

The course concluded with immersive team-based simulated scenarios aimed at consolidating the technical and non-technical skills covered.

Pre-course surveys to assess CICO training and preparedness were distributed and the workshop was evaluated by post-course survey.

Results

- The pilot workshop, which became rapidly oversubscribed, was held in June 2011 at a regional hospital center. Participants from the hospital attended on a voluntary basis and numbers were capped at 30. The cohort, composed of 14 consultants and 16 nurses was derived from anaesthesia and recovery(18), ICU(3), surgery(4) and emergency medicine(5).
- Pre-course questionnaires returned by approximately two thirds of nursing participants indicated that they felt **inadequately trained** to assist doctors in managing a CICO crisis and were not confident to **assist** doctors performing emergency cricothyroidotomies (Table 1). There was insufficient data from medical staff to evaluate their pre-course CICO training and preparedness.

Table 1. CICO Training and Confidence of Nursing Assistants to Assist with Rescue Techniques

	Number of participants in agreement	Number of participants undecided	Number of participants disagreeing
I have been adequately trained to manage or assist in a failed intubation/failed ventilation emergency requiring a cricothroidotomy	1	-	9
I am confident to assist in the performance of a needle cricothyroidotomy and jet ventilation	-	1	9
I am confident to assist in the performance of a surgical cricothyroidotomy	-	1	9

Results (cont'd)

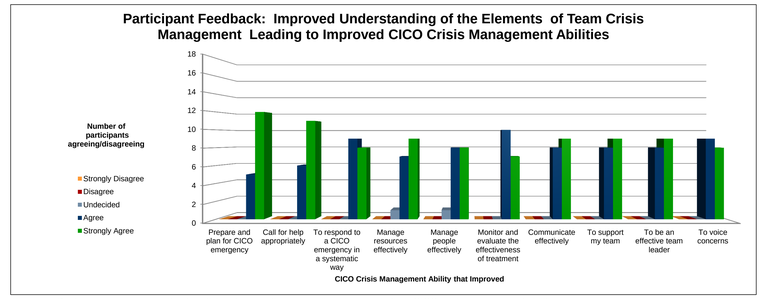

Figure 4. Post-course survey: results of participant perceptions regarding changes in their CICO crisis management abilities

Post-course surveys were returned by seventeen of thirty participants.

- Written responses almost universally indicated the workshop has **changed the way participants would manage and behave in a CICO crisis**. Changes cited included: a recognition of and willingness to declare the crisis, adoption of the CICO algorithm into clinical practice and preparedness to voice concerns and communicate.
  - Participants felt their ability to manage a CICO crisis improved following the course.
  - Non-procedural abilities that relate to human factors science particularly, such as crisis preparedness, communication and resource management were also felt to have improved (Fig. 4).
  - Regardless of their discipline and profession, all participants found the sessions presented useful.
- Responses indicated participants value **rehearsal of anterior neck procedures** and the **CICO algorithm.**. Teams also value practical rehearsal of non-technical skills addressed in sessions on **team culture, support and speaking up**.
- **Institutional changes following the workshop** include:
  - the CICO procedural algorithm has been widely adopted and posters are displayed in the hospital's operating theatres, intensive care and the emergency department
  - A CICO crisis management poster, incorporating team role allocation is being developed
  - Specific CICO kits with equipment to facilitate needle and surgical cricothyroidotomies, oxygenation and conversion to a definitive airway have been developed and assembled for addition to difficult airway trolleys throughout the hospital
  - CICO training for registrars and nurses has been introduced. Neighbouring institutions have also expressed interest in this training.

Conclusion

The literature identifies *unmet training needs* with regards to the CICO crisis involving both human and systems factors. Rapid oversubscription of this course together with pre course responses from participants suggesting insufficient training and a lack of confidence to assist in this emergency (table1) support this position.

This CICO crisis management course could complement existing CICO training for medical as well as nursing staff. It is particularly suited to multi-professional groups as the concepts of human factors and team-training have been integrated into the course -particularly in the practical workshop and immersive scenario sessions.

The workplace systems audit could also assist in enabling local quality assurance.

Institutional changes occurring following this workshop have been encouraging and support participants' claims regarding the value of the course, their improved understanding of human and system factors, and their altered approach to this crisis as well as their preparedness to act.

References and Further Information

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Further Information

A copy of the full workplace audit that institutions and individuals can use to check their preparedness to manage the CICO crisis can be found on the homepage of the Sydney Clinical Skills and Simulation Center http://www.scssc.edu.au/.

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