SAFETY

simulation for medical practice

SIMULATION APPROACH FOR EDUCATION AND TRAINING IN EMERGENCY

ASPECTS OF CRM, TEAMWORK, LEADERSHIP AND COMMUNICATION

University of Foggia- UniFG

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AUTHORS

Prof.ssa Gilda Cinnella

Prof.ssa Lucia Mirabella

Dr. Eva Epifani

Dr. Alessandra Morelli

Dr. Guido Gambetti

Dr Lucia Distaso

Dr. Chiara Caputo

Summary

1. Abstract

Crisis Resource Management (CRM) refers to the non-technical skills required for effective teamwork in a crisis situation. In addition to the nature of the task itself, numerous factors affect the performance of complex tasks at the level of the individual, team and the environment.
CRM originated with Crew (or 'Cockpit') Resource Management training developed by the aviation industry in the 1970s following the realization that 70% of airline crashes were due to human error resulting from teamwork failure. CRM training improves team performance and reduces errors, with the aim to improve patient outcome.

2. Origin of Crisis Resource Management and Non-Technical Skills

CRM

The term "CRM" (originally "cockpit" and now "crew or crisis resource management") was first coined in North America in the 1970s and 1980s, following the realization that 70% of airline crashes were due to human error resulting from teamwork failure. Initially, a typical aviation CRM training course included didactic sessions, group discussions, exercises, and simulations of critical incidents followed by instructor debriefings. The objective was to improve teamwork and decision-making skills with a focus on critical situations. (1)

NTS

The concept of "NTS" for airline pilots (Oxford Non-Technical Skills or NOTECHS) originated in the United Kingdom and Continental Europe. NTS have been described as "the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance". (1) In essence, they enhance workers' technical skills. Poor non-technical skills can increase the chance of error, which in turn can increase the chance of an adverse event. Good non-technical skills (e.g. high vigilance, clear communication, team coordination) can reduce the likelihood of error and consequently of accidents. (2)

CRM and NTS in health care cover similar skills during routine and rare but deadly events. The adaptation and adoption of CRM and NTS into health care relied upon three catalysts: the pioneering research of Dr. David Gaba and his Stanford team, an increase in general awareness regarding the importance of NTS/CRM in health care, and a push to improve patient safety. (1) High-risk, high-acuity areas of medicine were the first to incorporate CRM training (e.g., anesthesiology, emergency medicine, critical care, surgery, obstetrics, neonatal units) because of the clear cognitive parallels with aviation and the requirements in these areas to conduct dynamic decision- making and team management. However, the principles are also applicable to less dynamic settings that have less "lethality per meter squared" but a much higher throughput of patients per day. Such arenas include almost all medical disciplines but especially fields like nursing, dentistry, pharmacy, and multiple allied health professions. (3)

3. Factors affecting the performance of complex tasks

It is recognized that the performance of complex tasks is impaired by factors to do with the self (fatigue, inexperience, ill health, lack of knowledge) and environ- mental factors (interruptions, handovers, production pressure, equipment failure). These issues, together with the HALTS factors – being hungry, angry, late, tired or stressed – can be partly avoided by forward planning. (4)

Task

- complexity
- high stakes (e.g. life-threatening illness; medico-legal implications)
- time-critical
- incomplete information

Individual (e.g. HALTS – hungry, angry, late, tired or stressed)

- Fatigue
- Sleep deprivation
- Emotional disturbance (e.g. angry, stressed)
- Ill health and physical distress
- Inexperience
- Lack of knowledge

Team

- Role confusion
- High power distance/ authority gradient
- Ineffective communication techniques
- Dysfunctional relationships

Environment

- Interruptions
- Noise
- Handovers
- Production pressure (e.g. deadlines, quotas)
- Equipment failure
- Unfamiliar place and equipment

4. Core Principles of CRM

Despite the evolving nature of CRM in health care the core set of non-technical skills for health-care teams seems to be surprisingly consistent. We present the VA Palo Alto/Stanford formulation of the key points of Crisis Resource Management. Other varieties have substantial similarities to these, but each formulation has its own points of emphasis. Conceptually, the key points can be organized into a number of broad categories with several interactions and overlaps among one another: Team Management, Resource Allocation, Awareness of Environment, and Dynamic Decision-Making. (3)

Team Management

Leadership/Followership

Leadership means to conduct, to oversee, or to direct towards a common goal. In Crisis Resource Management, the "over- sight" role of leadership is emphasized (meaning the ability to "see the big picture") to decide what needs to be done and then prioritize and distribute tasks. (3)
This leadership role is best performed in a participative manner, but at times will need a more authoritarian approach in more time- critical situations. Even then, the leadership style should employ the least confrontational approach consistent with the goal, anticipating that maintaining good relationships will contribute to optimal outcomes in future interactions. (4)
Health care has always had members who give instructions (leaders) and those who carry out those instructions (followers). However, in modern health care these roles are less binary and more

situational. Increasingly, team members move in and out of leadership and followership positions. (1)

Role Clarity

Team roles need to be clearly understood and enacted. (3) Team membership is not a passive role: an effective team member must have a shared understanding of the team goals, be clear in their own taskwork responsibilities, feed information back to the leader, monitor and support other team members as needed and advocate or assert the need for corrective action when indicated. (4)

Workload Distribution

In complex crisis situations, a multitude of tasks must be performed almost simultaneously. When possible the leader stands back and designates work to appropriate team members. Leaders who immerse themselves in "hands-on" tasks may lose their ability to manage the "larger picture." (3)
The appropriate delegation of tasks and involvement of other team members is a necessary step to maximizing situational awareness. (4) In situations where the leader is the only person skilled in a particular technique, they may need to temporarily delegate all or part of the leadership responsibility to another team member. Distribution of tasks and leadership roles in a dynamic setting are not intuitive and are best explicitly taught and practiced. (3)

Requesting Timely Help

Generally, it has been found that individuals or teams in crisis situations hesitate to call for help, and when they eventually do so, it may be too late. Thus, we now urge participants to err on the side of calling for help even if they themselves and their colleagues might be able to manage without it. We acknowledge that there are practical limits to how often one can call for help without creating the "boy who cried wolf" phenomenon. When to call for help, and indeed how early is early enough, varies depending on the locale and its resources, time of day, experience and expertise of the clinicians, and complexity of the patient care situation. Simulations often trigger rich discussion about these issues. (3)

Effective Communication

In medicine, poor communication has been identified as a root cause of medical error in a myriad of health-care settings. Communication skills in dynamic acute patient care arenas — particularly those involving multifaceted teams that are temporary and transitory in nature — require a particular skill set for both followers and leaders. (3) Just like technical skills, communication needs to be practiced to attain proficiency and minimize decay. (1)
Usually, verbal communication is at the heart of interaction. Ordinarily it should be clear, directed, and calm. When necessary, the leader may need to be more assertive, to quiet team members, or to draw attention to pressing concerns. Many communications are in the form of orders, requests, or queries. There may be a tendency to utter commands or requests "into thin air" (e.g., "we need a chest tube") without clear direction at a recipient. Such messages are often missed; actions are

much more likely to be completed if a recipient is specifically identified. “Closed loop communication” is an effective method to ensure critical steps are completed. (3)
It involves:

1. The sender initiating a message
2. The receiver receiving the message, interpreting it and acknowledging its receipt
3. The sender ensuring that the intended message was received

In its simplest form, closed loop communication may involve a verbal restating of a drug order to ensure the correct dose and route of administration. (4)
Highly performing teams try to establish a “shared mental model” so that everyone is “on the same page.” Practical methods for achieving this coordination include out loud “stream of consciousness” commentary by the leader, periodic open recap and reevaluation of the situation by the leader, reminders by whomever is acting as the “recorder,” formal “time-outs” before procedures, or a formal patient-centered daily “care plan” in a ward or outpatient setting. The goal is for the team to be aware of the “big picture,” with everyone feeling free to speak up and make suggestions in the best interest of the patient if best practices are not being employed or effectively delivered. (3)

Resources Allocation and Environmental Awareness

Know Your Environment

Thorough familiarity with the operation of key equipment is vital in many high-tech environments such as the operating room, emergency department, and intensive care unit. Often even very small technical issues can make or break the clinical outcome for the patient. Other aspects of the environment include where equipment, medications, and supplies are located; who is available; and how to access resources when needed. (3) Knowledge of the environment includes knowledge of the human resources therein. When 10 people attend a resuscitation, it is useful to know not only their role, but also their level of experience. Even familiar settings may take on a different character on the weekend or when different team members are present. (3,4)

Anticipate and Plan

Anticipating and planning early in the patient’s treatment can be lifesaving. Such preemptive thinking and action is dynamic as an event unfolds — it is useful to anticipate the worst case of what might transpire and take reasonable steps to get the situation fails to improve ready in case. (3)
Continual observation, interpretation and communication of patient information is critical to identify and adapt to unanticipated changes in patient condition. Continually reviewing the plan and maintaining dynamic scepticism toward previous diagnoses or assumptions in response to incoming data are important to detect errors and adapt planned actions. (4)

Resource Allocation and Mobilization

The concept of “resource” has broadened to include not only equipment but also personnel and cognitive skills. Resources vary from setting to setting and team to team. It is imperative that teams are aware of resources available to them, for example, how to access extra staff, equipment, knowledge and how to mobilize resources early enough to make a difference. Some

resources have a particularly long "lead time" so an early decision to put them on alert or to get them mobilized can be critical. (3)

Dynamic Decision-Making

Situation Awareness

In a crisis situation, it is easy to become immersed in tasks or to become fixated on a single issue. Human attention is very limited and multitasking is difficult and often unsuccessful. Attention must be allocated where it is needed most. This is a dynamic process and priorities change over the course of the crisis. When an interruption occurs, it can derail the planned sequence of actions. (3)
Situational awareness is defined in terms of our ability to:

1. *Identify relevant cues*
2. *Synthesize these cues* based on prior knowledge, background, and experience
3. *Predict* how the situation will evolve

Each of these levels builds upon information from the preceding level. Situational awareness helps us ascertain "what is going on" in a given situation. (1)

Use all Available Information

Multiple information sources including clinical history, monitored data (e.g., blood pressure or oxygen saturation), physical findings, laboratory data, or radiological readings are critical for managing a patient in crisis. Many of these findings change rapidly and require constant vigilance. Some items are measured redundantly, allowing rapid cross- checking of information, which can be prone to artifact, transients, or errors. Judicious prioritization of information is fundamental. (3) Whenever the situation demands urgent and standardized action, the plan should be implemented without much discussion or delay. However, if the situation is less familiar and time allows, more time is usually spent on information management. This includes time dis- cussing, developing, and sharing individual mental models, therefore requiring input from various team members to ensure that everyone is "on the same page." (1)

Fixation Error

A fixation error is the persistent failure to revise a diagnosis or plan in the face of readily available evidence, suggesting that a revision is necessary.
Fixation errors are typically of three types:

I. *This and only this* — often referred to as "cognitive tunnel vision." Attention is focused on one diagnosis or treatment plan, and the operator or team is "blind" to other possibilities.
II. *Everything but this* — a persistent inability to hone in on the key problem despite considering many possibilities. This may occur for diagnoses that are the most "frightening" possibility or perhaps where treatment for the problem is outside the experience or skill set of the individual.
III. *Everything is OK* — one of the most ominous types of fixation error, in which all information is attributed to artifact or norms and possible signs of a catastrophic situation are dismissed. This type of error often results in a failure to even recognize that a serious

problem is present and a failure to escalate to "emergency mode" or to "call for additional help or resources" when time is of the essence.

Individuals and teams who are aware of the potential for fixation error can build "resilience" into their diagnostic and treatment plans by "seeking second opinions" and reevaluating progress. The "10-seconds-for-10-minutes principle" posits that if a team can slow its activities down just a little, it can gain more than enough benefit in rational decision-making and planning to offset the delay. A 10-s pause and recap may reveal information and aid decision-making, preventing diagnostic errors and missteps which effectively "buy extra time" in a crisis situation. (3)

Cognitive Aids

Cognitive aids are tools to help practitioners to remember and act upon important information and plans that experience shows are often "inert" or difficult to use unaided in stressful conditions. Although the term cognitive aid includes "checklists", the concept also includes written protocols guidelines, visual or auditory cues, and alert and safety systems. Cognitive aids should not be considered a replacement for more detailed understanding of the material. Their use is not a reflection of inadequate or inept personnel. They are however extremely valuable during a crisis because human beings have innate difficulty with recall and cognition at these times. Health-care teams must be familiarized and trained in the use of cognitive aids, with a combination of simulated emergencies and their use in real clinical situations. (3)

Key points to remember

Hereunder we provide some key points for each CRM principle, as originally provided by Dr. Gaba CRM program, which could be of particular usefulness for the trainee.

Figure 1 Crisis Resource Management key points (Diagram courtesy of S. Goldhaber-Fiebert, K. McCowan, K. Harrison, R. Fanning, S. Howard, D. Gaba

5. Conclusion

Patient safety depends on the skills, vigilance, and judgment of trained individuals working as members of a clinical team that includes anesthesiologists, surgeons, nurses, and technicians. Now, as never before, safe outcome depends both on better knowledge and better management. This requires organization of caregivers, who may be strangers from diverse disciplines, into teams. (5) Evidence shows that training teams in the principles of CRM can result in a significant observable reduction in clinical error, without an increase in caregiver workload. Multidisciplinary teams, including trauma and medical emergency teams, have also shown performance benefit as a result of training in this area. (4)

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