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Creating and applying shared mental models in the operating room

Abstract

A shared mental model is a concept from high reliability environments, like aviation, to help teams develop collective understanding of how they will work together to safely accomplish their goals. Areas of high-risk health care like the operating room have adapted this concept to improve interdisciplinary teamwork and thus improve patient outcomes. Non-technical skills including communication, situational awareness, task management and leadership are employed to produce a functional shared mental model. Nurses play an important role in the change process as traditional hierarchical cultures, differing communication styles between doctors and nurses and an increasingly transient workforce are all challenges to the use of shared mental models in the operating theatre.

Keywords: shared mental models, operating theatre, interdisciplinary team, non-technical skills, nursing

Introduction

Although there has been continual work to improve patient safety in the operating room, adverse events are all too common. The World Health Organization (WHO) estimates that in 2012 there were over 300 million surgical procedures performed¹. In industrialised countries almost half of the adverse events of hospitalised patients were related to surgical care and in over 50 per cent of those cases the adverse events were considered to be preventable². Poor teamwork behaviour was identified by the US Joint Commission on Accreditation of Healthcare Organizations as the main cause in 63 per cent of all adverse events occurring between 2004 and 2013³.

Research concerning teamwork in high reliability environments like in the aviation and nuclear power industries, where mistakes are often fatal, demonstrate that minimising mistakes frequently requires addressing non-technical factors rather than enhancing technical skills⁴. Surgery's unpredictable nature

has driven health care facilities to adapt and apply systems created to improve these non-technical factors. The creation and application of a shared mental model, a prevalent method used in high reliability environments, facilitates the creation of a shared understanding and focus between the interdisciplinary team to help improve patient outcomes⁵.

A mental model is the form that an individual person's thinking must take to help them understand, describe, explain and predict how things they interact with will function or operate^{4,5}. When mental models are applied within a team they become a shared mental model which represents shared understanding and expectations of how patient care will be delivered^{5,6}. When a team possesses a shared mental model team members can identify how each of them contributes to the task and have a framework and appropriate strategies to engage in the task along with the ability to incorporate and adapt to new information to ensure completion of the task^{4,7}.

How nurses can create shared mental models

Creating a shared mental model requires cognitive skills, including decision-making and situational awareness, and interpersonal skills, like communication and leadership, which are all non-technical skills frequently employed by perioperative nurses. Academic literature provides multiple examples of how the application of non-technical skills to create a shared mental model promotes better outcomes for surgical patients^{8-11,12}.

Communication is the foundation

Communication is an essential element for any endeavour where teamwork is required. Good communication between members of the interdisciplinary team in the operating room (OR) correlates with improved task processes, motivation and team performance^{13,14}. Conversely, poor communication increases the chances of critical incidents and lengths of stay after surgery along with decreasing patient outcomes and job satisfaction in nursing staff^{6,13,14}.

Communication in the OR can start at the beginning of the day with something as simple as interdisciplinary team members introducing themselves to other team members to create a dialogue^{6,15}. When all the interdisciplinary team are present, time can then be allocated to what is sometimes referred to as pre-briefing, for members to discuss their expectations of how the surgical list may unfold¹⁶. Perioperative nurses are an essential part of generating this discussion as they have been found to favour plans being established and verbalised more than surgeons¹¹.

Topics addressed during the pre-briefing can include the required surgical equipment and instrumentation, patient positioning and procedure lengths¹⁶. This also provides opportunities for interactive communication, feedback and identification of any operational issues important for maintaining patient safety¹⁷. This discussion establishes a mental model that is shared by the team even when members are unfamiliar with each other, and this facilitates higher work skills performance and better anticipation of other team member's needs^{4,18}. In OR environments where there are time constraints, heavy clinical workloads and transient staff the creation of a shared mental model becomes even more critical¹⁹.

A lack of communication that is often seen in the absence of a shared mental model has been identified as one of the greatest risks posed to surgical patients²⁰. This raises concern as one research study indicated that while nurses widely advocated for pre-briefings sessions, such sessions only occurred in 12 per cent of observed surgical lists⁸.

Utilising the WHO checklist

The shared mental model once created is then adapted or enhanced by the communication generated from utilising the WHO surgical patient safety checklist at the start of each procedure¹². This standardised checklist has contributed to significantly reducing patient morbidity and mortality in the OR¹⁶. While a particular study found properly performed checklists directly correlate with higher non-technical skills in the interdisciplinary team, it also found that only 21 per cent of the 1261 checklists analysed were fully completed²¹.

Communication drives situational awareness

The amount of communication directly relates to the amount of situational awareness in the OR²². Situational awareness is a dynamic alertness developed and maintained through gathering and transferring information, monitoring the environment and anticipating potential outcomes⁹. Good communication and situational awareness optimise task management of the team. Task management includes planning, preparing and prioritising of essential tasks while also allowing the execution of simultaneous tasks if required^{9,10}.

All these non-technical skills working together form a functional shared mental model template which perioperative nurses can use to incorporate any intra-operative events and findings and adapt their practice accordingly¹⁰. Adopting specific communication techniques like 'thinking aloud', closed-loop communication and graded assertion complements their established shared mental model and improves clinical management⁷. Also, nurses recognising emotional states of interdisciplinary team members, including their own emotional state, allows them to control the tone and direction of communication which helps defuse stressful situations and avoid unnecessary conflict¹⁹.

A shared mental model also has the ability to create an upward spiral as good communication, situational awareness and task management creates higher quality communication, which increases situational awareness and further optimises task management in the interdisciplinary team^{9,10}. This also helps create a more dynamic coordination between the interdisciplinary team that optimises

their ability to respond in situations where unexpected or critical changes occur during surgery^{13,23}.

A shared mental model continues even after the dressings have been applied as post-operational debriefs provide another opportunity to enhance the shared mental model through constructive communication about errors, misunderstandings and deviations in the surgical plan that have occurred⁴. This encourages a learning culture that involves reflection and revision and, along with using a pre-briefing, has been shown to contribute to halving the risks of complications in patients undergoing surgery^{13,16}.

Challenges to creating shared mental models

Traditional hierarchical culture

While virtually all modern health care is delivered by interdisciplinary teams, OR teams still suffer from a conventional modelling which uses a multidisciplinary approach⁷. This approach operates in a hierarchy where one-way communication can negatively influence interactions and information exchange as less powerful members, predominantly nurses, become reluctant to question actions or encourage team conversations because of the possible reprisals from more senior staff or medical colleagues^{11,22}. This hierarchy threatens patient safety as it stunts communication, limits situational awareness and increases the potential for critical errors to occur^{10,22}.

Communication: nurses vs doctors

Multiple studies address the differences in the content, structure and priorities between the way nurses and doctors communicate^{7,24}. Generally nurses are taught to communicate in broader narratives whereas doctors are trained to be succinct and to move quickly

to the root of the situation²⁰. These fundamental differences in communication styles have been identified as impediments to cohesiveness in interdisciplinary teams and are associated causes of failures in interdisciplinary communication²⁴.

Health care becoming increasingly transient

The interdisciplinary team in the modern OR has become increasingly transient^{13,25,26}. Junior doctors regularly rotate through health care facilities, increased numbers of health care professionals now come from different cultural and training backgrounds and there is a growing reliance on nursing casual labour pools²⁶. Limited English vocabularies and unfamiliarity with work cultures, social norms and hospital processes can hamper effective communication and teamwork in the OR²⁵.

The existence of these challenges highlights the reason that shared mental models are needed to help promote communication in interdisciplinary teams. Changes in higher education and workplace training in communication in interdisciplinary health care and the processes that promote this are systematic requirements needed to overcome these challenges. While these changes are beyond the influence of the majority of individual perioperative nurses, individual nurses can begin to personally apply and promote the concept of a shared mental model to change the organisational culture in their workplace.

Conclusion

Shared mental models have been adapted to ORs to help improve interdisciplinary team communication and patient outcomes. Good communication creates situational awareness which

in turn optimises task management. Many challenges exist to the application of shared mental models in the OR and there is no one particular solution that will overcome them all. Education and training programs for interdisciplinary communication have strong support in academic literature but in practice this change will occur over the long term. Nurses' integral role in the interdisciplinary team puts them in a prime position to use a shared mental model to influence their OR's current organisational culture. While the challenges to implementation are great, the benefits of implementation are greater.

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