

The Night in the ICU

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Human Factors in Critical Care Medicine

The lack of non-technical skills is associated with poor performance and patient harm in medicine.

and patient harm. In fact, the main objective of HF is to optimise the interaction of humans with their work environment and technical equipment in order to maximise patient safety and efficiency of care.

Situation Awareness

Situation awareness (SA) is defined as the perception of the elements in the environment within a specific volume of time and space, the comprehension of their meaning and a projection of their status in the near future (Endsley 1995). The basic components of SA are 1) perceiving (an active process of collecting data and gathering information by observing the environment and monitoring all the sources), 2) understanding (combining data with knowledge and experience, interpreting information collected from the environment to identify the match or mismatch between the situation and the expected state), and 3) projecting (anticipating future events). Accurate SA is very important for subsequent decision-making, teamwork and task management, and it is therefore crucial for providing optimal performance during care and treatment of critically ill patients (Endsley 1995).

Decision-making

Decision-making (DM) is the process of choosing a course of action in a scenario that offers multiple alternatives to meet the needs of a given situation. The two main styles of decision-making are intuitive, or type I, and analytical, or type 2. The intuitive decision style is the ability to

make quick decisions when time is short, based on previous experience. An intuitive decision style is developed through practice; it is a rapid, subconscious and automatic process. The analytical decision style is developed in a thorough, slow, systematic and logical manner and it is generally more reliable. It is characterised by spending time reviewing all the details and making sure all decisions comply with formal guidelines and requirements, and it implies a subsequent analysis of advantages and disadvantages for each option. The DM process includes evaluation of the situation and multiple alternatives, choice of one of these alternatives, implementation and communication of the decision made, and finally, re-evaluation (Croskerry and Nimmo 2011). In a life-threatening emergency and in an intensive care unit (ICU) setting, meta-cognitive strategies could include a personal reflection on human factors principles within the clinical situation, attention to self-awareness about potential cognitive errors and taking a moment to pause before rushing into new decisions (Reason 2000).

Communication

Communication is the exchange of information between people through speaking, writing or by other medium. The process includes a sender, a receiver and the channel (medium). It can be classified as verbal (oral or written) and nonverbal. Nonverbal communication can include signs, symbols, gestures, body language and facial expressions. It can complement, repeat, reinforce,

Human Factor (HF) is an established scientific discipline that studies the interrelationship between humans, equipment, and work environment. Core aspects of HF, widely known as non-technical skills (NTS), include three dimensions 1) cognitive (situation awareness, decision making), 2) interpersonal (communication, team working, leadership), and 3) personal resources (managing stress and coping with fatigue) (Flin et al. 2008). Additional important NTS include empathy and resilience.

The study of HF began in the aviation industry about 40 years ago after studies suggested that deficiency in NTS may have been significant in fatal accidents. The world of aviation with its emphasis on safety has directly influenced our current approach to anaesthesia, critical care medicine, and healthcare safety in general. NTS are as important to promoting patient safety as the technical knowledge and expertise required to clinically treating patients' physiological abnormalities. NTS training was developed recently in healthcare as a result of many reports showing that the lack of NTS might lead to medical errors

substitute, regulate, or even contradict verbal communication. Clear communication means that information is conveyed effectively between people.

Effective communication among team members is widely recognised as one of the most important factors in delivering high-quality healthcare, especially in a complex setting such as an intensive care unit, where different professionals interact with each other (Vermeir et al. 2015).

The Joint Commission reported that communication errors were at the top of the list of root causes of sentinel events in hospitals, contributing to 65% of events. Most communication errors occur during the handover of patient care between different groups (Siewer and Hochman 2015). Error-reporting systems now frequently focus upon poor communication as an antecedent to error in critical care medicine; interventions to improve communication in the intensive care unit have resulted in reduced reports of adverse events, and simulated emergency scenarios have shown effective communication to be correlated with improved technical performance (Reader et al. 2007).

Teamwork

Teamwork is the process of working collaboratively with a group of people in order to achieve a goal. Intensivists and non-intensivist physicians, critical care nurses, advanced practice providers, pharmacists, respiratory care practitioners, rehabilitation specialists, dieticians, social workers, case managers, spiritual care providers, each one of them provide unique expertise and perspectives to patient care, and therefore play an important role in a team that must address the diverse needs of patients and families in the ICU (Donovan et al. 2018). The principles that characterise a successful health care team include 1) shared goals, 2) clear roles, 3) effective communication, 4) measurable processes and outcomes, and 5) effective leadership (Mitchell et al. 2012; Schmutz and Manser 2013).

A growing body of literature links the quality of teamwork to the quality and safety of health care delivery. Work in this area has focused on three domains: (a) the quality and safety of care, (b) patient experience, and (c) clinical patient outcomes (Rosen et al. 2018).

Leadership

Leadership can be defined as the ability to lead a team, considering the particular needs of each team member, following high standards of clinical care. Valuable leadership skills include the ability to delegate, inspire and communicate effectively. Other leadership traits include honesty, confidence,

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commitment and creativity. The leader should also prioritise the importance of the team goal over other individual member goals, and he should motivate team members and establish a positive environment. The role of the leader is to keep the big picture and the control of the situation. The team members will unavoidably be consumed with their actions, but this must not happen to the leader. The leader cannot let himself engage in any particular task that would narrow his attention span; the leader sets the priorities for any given moment, delegates the tasks, and respectfully takes feedback from others (Riskin et al. 2015).

Managing Stress

Work-related stress is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope. Because workplace stress can influence physical and emotional well-being, and reduce efficiency and quality of life, dealing with stress is a big challenge for many healthcare professionals. Causes of occupational stress include long hours, excessive workload, dealing with death and dying, interpersonal conflicts with other staff, unfair management practices and lack of support from supervisors and managers. Stress may be associated with irritability, job dissatisfaction, depression, and sleep problems, and also with absenteeism and job turnover. Effective interventions to prevent work stress and to improve job satisfaction of employees are of the utmost importance. Stress management training can reduce the degree and intensity of current stress reactions as well as help to develop skills for preventing additional, harmful stress reactions. Therefore, healthcare institutions and management should include stress evaluation tests and coping models for improving job satisfaction and productivity. Stress is normal and, as human beings, we have multiple strategies for coping with stress. Therefore, working in a highly stressful department like intensive care and frequently managing life-threatening emergencies will not be an issue, unless the amount of stress exceeds our coping mechanisms for dealing with that stress. The key factor is, therefore, self-awareness of your own coping anti-stress mechanism (Koinis et al. 2015).

Coping With Fatigue

The link between health care workers' fatigue and adverse events is well documented, with a substantial number of studies indicating that the practice of extended work hours contributes to high levels of worker fatigue and reduced productivity.

Fatigue can lead to memory lapses, delayed judgment, diminished reaction time, lapses in attention or inability to stay focused, ineffective communication, irritability, and lack of motivation. To reduce the occurrence and impact of health workers' fatigue, the Joint Commission recommends that all health care organisations should consider inviting employee input when creating work schedules to reduce fatigue, adopt a fatigue-management plan with scientific strategies for reducing fatigue, educate staff on the importance of sleep and sleep hygiene, and consider fatigue a potential cause when reviewing adverse events (Noone and Waclawski 2018).

Empathy

Empathy is an essential element in providing quality patient care and consists of the ability to understand and share the feelings of another. Expressing empathy is highly effective and powerful; it builds patient trust, calms anxiety, and can improve health outcomes. In fact, a meta-analysis of studies that evaluated various contextual influences on patient outcomes found that physicians who adopted a reassuring, warm and friendly approach were more effective than those employing a detached concern (Di Biasi et al. 2001). Despite the clear importance of empathy in clinical settings, many physicians experience difficulties in empathising with their patients. Empathy towards co-workers is also a key skill in the workplace. It can help in resolving conflicts, in building more productive teams, and it contributes to the improvement of the relationships among colleagues.

Resilience

Resilience is the process of adapting well in the face of adversity, trauma, threats or significant sources of stress. It is an important skill in critical care medicine because it plays a role in the ability to withstand both everyday workplace stressors and serious incidents without becoming psychologically harmed. Low resilience is associated

with burnout, low compassion satisfaction, high secondary traumatic stress and more frequent use of maladaptive coping mechanisms, including self-blame, behavioural disengagement and substance use (McCain et al. 2018; Baid 2018).

Non-Technical Skills Assessment and Training

There are several tools in literature to evaluate NTS that should be applied in critical care medicine. Training, including simulation, to develop NTS, has been successfully introduced in the past years with significant benefits (Flin and Maran 2004; Hagemann et al. 2017). Simulation has multiple well-documented advantages including meeting educational needs, improving individual and team performances, identifying latent patient safety threats and infrastructural defects. Furthermore, simulation can facilitate introducing protocols and guidelines and assessing their application. Several patient safety incidents appear to be related to deficiencies in human factors and ergonomics. Simulation provides an ideal approach not only for addressing deficiencies in human factor skills, but also in analysing and addressing key environmental and organisational issues and how these interplay and affect outcomes in-patient care pathways. Simulation is especially important in ICUs as patient care is complex and multi-disciplinarian, therefore increasing the likelihood of medical errors. There are barriers to setting up a simulation programme, mainly related to costs and clinical workload.

Conclusion

There is scientific evidence that the lack of NTS is associated with poor performance and fatal errors in critical care medicine. The principles and practice of HF can help intensivists and all the multidisciplinary ICU teams to deliver high quality of care to patients and to work in a nicer and more productive environment (Carayon 2006; Carayon 2010).

Conflict of interest

None

Key Points

- Human Factors (HF) is an established scientific discipline that studies the interrelationship between humans, equipment, and work environment.
- HF include situation awareness, decision making, communication, team working, leadership, managing stress and coping with fatigue, empathy and resilience.
- The main objective of HF is to optimise the interaction of humans with their work environment and technical equipment in order to maximise patient safety and efficiency of care.

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