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Responding to an emergency – how stress affects medical trainees

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Whether arriving as a first responder to the scene of a motor vehicle accident or attempting to resuscitate a patient in the emergency room, medical trainees who find themselves in an emergency situation have to think quickly on their feet. The physiologic stress response that occurs during such an event is influenced by many factors. Most importantly, the individual must assess whether they have the resources needed to solve the problem. These include intellectual, social, material and emotional resources. If the individual perceives that they have the necessary resources, the situation is defined as a challenge. On the other hand, if the individual does not feel that they are adequately equipped to handle the situation, they will experience distress.\(^1\)

In any stressful event, the classic “fight-or-flight” response, described by Walter Cannon in the 1930s, is achieved by activating the sympathetic nervous system.\(^1\) The release of epinephrine and norepinephrine, in a matter of seconds, results in characteristic increases in heart rate and respiratory rate, as well as diaphoresis and increased blood pressure. In addition, the individual may experience feelings of anxiety. Hans Selye, also in the 1930s, divided this response into stages: the alarm phase, in which the individual identifies the stressor and activates the sympathetic nervous system, the resistance phase, in which the body attempts to cope with the stressor, and the exhaustion phase, in which the body is unable to continue to function normally.\(^2\)

Another dimension of the stress response is the activation of the hypothalamic-pituitary-adrenal axis and the subsequent release of cortisol into the bloodstream. This response takes longer to initiate, occurring within 5-40 minutes after the stressor is identified. The result of the increased cortisol level is an increase in blood glucose as well as variable effects on the brain, specifically in the amygdala, hippocampus and prefrontal cortex.\(^1\) The amygdala is an area of the brain thought to be most closely associated with fear, while the hippocampus has been demonstrated as a necessary component in activities relating to memory. The prefrontal cortex drives executive functions, such as attention and decision-making.

A large amount of research has been done evaluating the impact of stress on an individual’s cognitive abilities. Though the results seem to be conflicting, there are some common patterns that have been described. Studies have shown that an individual’s selective attention to a stressor may be enhanced, allowing them to block out other seemingly irrelevant information. If the stressor is the situation at hand, as in a need to stop bleeding in a car accident victim, then this can be viewed as beneficial. On the contrary, if the situation at hand is intubating a patient, but the stressor is the attending physician who is judging one’s performance, then the attention will be geared toward the physician and not the task at hand, which could be detrimental.\(^2\) Other researchers have shown that tasks requiring divided attention, as in managing multiple trauma victims, are impaired due to the stress response.\(^1\) One proposed mechanism for this impairment is the over activation of protein kinase C by norepinephrine in the prefrontal cortex.\(^4\) Stress may lead medical trainees to experience “tunnel vision” or “premature closure” in which they do not consider all possible diagnoses in an emergency situation.\(^2\)

Another area of cognition affected by stress is memory. Many experiments have demonstrated that stress impairs working memory, possibly due to the dopamine efflux caused by cortisol in the prefrontal cortex.\(^5\) The ability of a medical trainee to remember a variety of information for even a short period of time could be drastically impaired if the individual is in distress. Similarly, memory retrieval is significantly impaired during stressful situations, a phenomenon linked with cortisol’s effect on beta-2-adrenergic receptors in the hippocampus and the consequent decrease in cAMP.\(^6\) This impairment is most notable during free recall, as compared to recognition memory. There is some benefit of stress on memory, nonetheless, and this is in memory consolidation. Stress has been shown to improve memory consolidation of events specifically linked with the stressor.\(^2\) It is important to appreciate, however, that it is the stressor and not necessarily the task at hand that will be encoded to long-term memory.

Stress can also impact an individual’s decision-making process, with research showing an increase in hyper-vigilant decision-making during stressful situations.\(^2\) This is defined as impulsive, disorganized decision-making, with increased use of heuristics, which are experience-based techniques for problem solving, learning and discovery. While this may be acceptable for an experienced physician with many well-developed heuristics, it may not be beneficial to a medical trainee who is just beginning to form such cognitive tools. One study involving medical radiography trainees found a decrease in diagnostic accuracy associated with increased anxiety levels.\(^7\)

It is appreciated that each individual responds to stressful situations a little differently and that unique situations may activate different neural and hormonal pathways within the same individual. Three important factors may influence a medical trainee’s response to stress. The first is the individual’s coping style, be it problem-focused, emotion-focused or avoidance coping. The second is the individual’s perceived control of the situation and whether or not there is thought to be an internal or external locus of control. Finally, the social support of the individual could affect the stress response, with increased social support being associated with decreased cortisol levels.\(^2\)

The following scenario is a real example, experienced by one of the authors, and illustrates a situation in which a medical trainee may experience significant stress.

While doing an observership in a pediatric emergency room, I was informed by the doctor that there was a trauma case being brought in by ambulance. Suddenly, I felt much more awake and the entire emer-
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gency room seemed more alive. The paramedics wheeled in a boy on a stretcher; unconscious with normal responses to pain, but not much else. His mouth and nose were covered with blood, so a nurse passed me a gown, gloves and a face mask, explaining, “We don’t know what or if he has anything. It’s always better to be on the cautious side.” As I assisted the nurse in removing the boy’s shoes and clothing and checking for I.D., I observed the doctor and other nurses assess the fundamentals of medicine: ABC – airway, breathing, and circulation.

The patient’s periphery was cool to the touch, so they brought in warm blankets and covered him from head to toe. His blood pressure was taken immediately by one member of the team, while someone else checked for his pulse. The doctor cleared the airway, checked the nasal passage to ensure there wasn’t a blockage and then assessed for breathing. The head nurse stood to one side, going systematically through all the vitals, asking questions as different team members yelled back their responses.

When it was recognized that the ABCs were stable, a visible tension left the room as the secondary assessment continued. The patient had to be moved from the spinal board to the stretcher and I was called in to assist with supporting the patient, while the physician checked for any visible or palpable trauma. Next, a urine tox-screen was needed, so I was told to hold down the patient while they inserted a catheter. As the catheter was being put in, the patient began to fight against the pain and four people worked actively to try and hold the patient down. Finally, the catheter was in, the urine sample taken, and the catheter removed. It was time to try and wake the patient up.

In my discussion with the physician after the episode, I learned a lot of things. I realized that no one was idle in the procedure room; everyone worked together as a team to help stabilize the patient. As a first year medical student, the experience, while exhilarating, also demonstrated to me to the necessity of focus required during emergency situations. There isn’t always time to take a step back and consider all your options. Your instincts direct you towards the vitals and as you assess those, you use key markers along the way to indicate the next step. Though the physician was tense during the episode, stress did not seem to impair the actions of my preceptor. I, on the other hand, felt frozen to the spot at times and only moved when instructed to.

Ultimately, the impact of stress on one’s ability to think on their feet should not be underestimated. Medical trainees who are in distress will experience cognitive changes that affect their attention, memory, decision-making and more. The positive outlook is that, with experience, stress levels should decrease and, in emergency situations, one will be better able to think quickly on their feet.

REFERENCES