

The Body And Stress Case Study

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Mr. X Is Immediately in the Acute Stage of a Healthy Stress Response

Mr. X witnesses his son fall from a treehouse and faces an immediate threat to the child's safety. His acute stress response is adaptive because it directs attention, cardiovascular output, energy, and behavior toward urgent action. The autonomic nervous system and hypothalamic-pituitary-adrenal (HPA) axis respond on different timescales. The sympathetic-adrenal-medullary system acts within seconds, while the HPA axis develops over minutes. The original case correctly recognized that stress hormones can help him cope, but adrenaline and epinephrine are the same chemical, and endorphins are not released specifically to prevent headache or "pain in the heart." A precise explanation should distinguish neurotransmitters from hormones and describe their likely functions without assuming that every substance is measured in this individual case.

Which Neurochemicals and Hormones Are Released?

The immediate sympathetic response stimulates release of norepinephrine from sympathetic nerve endings and epinephrine, with some norepinephrine, from the adrenal medulla. The hypothalamus also releases corticotropin-releasing hormone, which stimulates the anterior pituitary to secrete adrenocorticotrophic hormone. That hormone then stimulates the adrenal cortex to produce cortisol. Endogenous opioids such as beta-endorphin may be released during severe stress and can alter pain perception. Glucagon rises and insulin action may be reduced so that glucose remains available. The exact concentrations and timing depend on severity, duration, health, medication, and individual variation.

How Norepinephrine Helps Him Respond

Norepinephrine increases alertness, vigilance, and attention to threat. In the peripheral sympathetic nervous system, it contributes to vasoconstriction and an increase in blood pressure. These effects can support rapid action by maintaining perfusion to essential organs. Excessive norepinephrine may produce trembling, anxiety, or narrowed attention, but in the immediate event it helps Mr. X orient toward his injured son, call for assistance, and respond to instructions. It does not create moral courage by itself; behavior also depends on knowledge, appraisal, and social responsibility.

How Epinephrine Helps Him Respond

Epinephrine increases heart rate and contractility, dilates airways, mobilizes glucose and fatty acids, and redistributes blood flow toward skeletal muscle and other tissues important for rapid response. Mr. X may feel pounding in his chest, faster breathing, sweating, and heightened sensory awareness. These reactions prepare the body to move or provide aid. Blood is not simply diverted from all “external organs”; circulation changes selectively. Skin and gastrointestinal blood flow may decrease, while cardiac and skeletal-muscle supply is supported. If he has cardiovascular disease, extreme activation could also create risk.

How Cortisol Helps Him Respond

Cortisol supports energy availability by promoting gluconeogenesis and influencing protein and fat metabolism. It also modifies immune and inflammatory activity and helps sustain the stress response after the first sympathetic surge. In an acute emergency, this can assist continued functioning. Cortisol is often called a stress hormone, but it is necessary for normal daily regulation and does not act only during crisis. Persistently elevated or disrupted cortisol patterns during chronic stress can contribute to sleep, metabolic, immune, and emotional problems. One event does not automatically cause these long-term outcomes.

How Endogenous Opioids May Help

Endogenous opioids can reduce the perception of pain and distress during intense stress, allowing a person to act despite an injury or physical strain. Mr. X might not immediately notice minor pain while helping his son. This temporary analgesia does not prevent injury or prove that the heart and head are protected. Pain can appear after the emergency subsides. A healthcare professional should encourage him to report symptoms such as chest pain, fainting, or severe headache rather than assume they are harmless consequences of stress.

Acute Stress and Cognition

Moderate activation can focus attention, but extreme stress can impair working memory, fine motor control, and complex decision-making. Mr. X may remember only part of what occurred, repeat questions, or struggle to process medical information. Healthcare staff should provide short instructions, confirm understanding, and repeat important information later. Family members under stress should not be expected to absorb detailed consent, medication, or discharge teaching in one conversation. Written information and a designated contact can help. (Hall & Hall, 2021)

How Might Acute Stress Alter His Acid–Base Balance?

If Mr. X begins breathing rapidly beyond the metabolic need for ventilation, he may exhale carbon dioxide faster than the body produces it. Arterial carbon dioxide pressure falls, shifting the carbonic acid–bicarbonate equilibrium and raising blood pH. This is acute respiratory alkalosis. The original response correctly identified loss of carbon dioxide and an increase in pH but used incorrect chemical notation and described the imbalance as involving one side of the body. The reaction is systemic: $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3 \rightleftharpoons \text{H}^+ + \text{HCO}_3^-$. Lower CO_2 reduces hydrogen-ion concentration, increasing pH.

Symptoms of Acute Respiratory Alkalosis

Hyperventilation-related respiratory alkalosis can cause lightheadedness, tingling around the mouth or fingers, chest tightness, palpitations, muscle cramping, and a sense of unreality. These symptoms can increase fear and lead to more rapid breathing. However, chest pain or breathing difficulty must not be attributed automatically to anxiety, particularly in a person with cardiac or pulmonary risk. Healthcare professionals should assess vital signs, oxygenation, symptoms, and history. Slow coached breathing may help when serious causes have been excluded, but breathing into a paper bag is not recommended because it can be dangerous if the problem is not anxiety.

Compensation for Respiratory Alkalosis

In an acute episode, intracellular and blood buffering provide limited compensation. If respiratory alkalosis persists, the kidneys increase bicarbonate excretion and reduce hydrogen-ion excretion over hours to days. Mr. X's immediate event is likely brief, so renal compensation would be limited. The pH may normalize as his breathing settles. Arterial blood gas testing would be used only if clinically indicated, not simply because he appears worried. The case should distinguish a plausible physiological mechanism from a confirmed diagnosis.

His Son Requires Extended Hospitalization

When the immediate emergency becomes prolonged, Mr. X and the child's other parent enter an adaptation period. They may alternate between vigilance, fear, exhaustion, hope, guilt, and practical problem-solving. Hans Selye's general adaptation syndrome describes alarm, resistance, and exhaustion, but modern stress science recognizes that responses are not a fixed sequence for every person. Ongoing activation can become allostatic load—the cumulative physiological burden of repeated or chronic stress. Parents may neglect sleep, meals, medication, movement, and their own symptoms while focusing on the child. (McEwen, 2007)

Physical Symptoms During Prolonged Stress

Mr. X may experience muscle tension, headache, gastrointestinal disturbance, appetite change, fatigue, elevated blood pressure, palpitations, sweating, and sleep disruption. Chronic sleep loss can impair attention and emotional regulation. Sitting for long periods may cause stiffness and reduce circulation. Stress can worsen existing hypertension, diabetes, reflux, migraine, or pain conditions. These risks do not mean that stress alone explains every symptom. Chest pain, severe shortness of breath, weakness, confusion, or fainting requires prompt medical assessment. Caregivers can become patients if warning signs are ignored.

Emotional and Cognitive Risks

Parents may experience acute stress symptoms, anxiety, depressed mood, intrusive memories, irritability, guilt, or difficulty concentrating. A normal emotional response to a child's injury should not be labeled automatically as a psychiatric disorder. Symptoms become clinically concerning when they are severe, persistent, or impair functioning. Hospital social workers, chaplains, psychologists, and family-support services can provide assistance. Staff should ask both parents how they are coping rather than assuming that the quieter person is managing well.

First Intervention: Scheduled Hydration and Nutrition

The original answer recommended electrolytes and oral rehydration solution for both parents. Healthy adults do not usually need special electrolyte products merely because they remain at a bedside. The first intervention is regular access to water and balanced meals or snacks. Staff or family members can help establish a schedule: drink with meals, keep a refillable bottle where permitted, and leave the bedside for nourishment. Foods containing sodium, potassium, magnesium, carbohydrate, protein, and fat support ordinary needs. Excessive plain water can also be harmful in rare cases, so hydration should be guided by thirst, urine, medical conditions, and clinician advice rather than forced intake.

Second Intervention: Monitor Losses and Medical Conditions

Oral rehydration solution is appropriate when fluid and electrolytes are being lost through vomiting, diarrhea, heavy sweating, or poor intake, not as a routine stress treatment. The second intervention is to identify risk and respond appropriately. Parents with diabetes, kidney disease, heart failure,

hypertension, or medicines affecting fluid balance may need individualized guidance. Signs of dehydration include marked thirst, dry mouth, reduced or dark urine, dizziness, and weakness. Hospital staff should direct them to appropriate medical care if symptoms appear. Caffeine and alcohol should not replace water or sleep.

Additional Caregiver Interventions

Parents should alternate bedside time where possible, take brief walks, sleep in shifts, continue prescribed medicines, and accept practical help. A written list of questions can reduce cognitive burden during rounds. One trusted relative may update extended family so the parents do not repeat distressing information. Staff can explain visiting facilities, food access, accommodation, financial assistance, and family meetings. Supporting caregiver health also benefits the hospitalized child because exhausted parents may struggle to understand decisions or provide reassurance.

Using Romans 15:13 in Spiritual Care

Romans 15:13 expresses a prayer that the God of hope fill believers with joy and peace as they trust, so that they may overflow with hope through the power of the Holy Spirit. If Mr. and Mrs. X identify as Christian and welcome spiritual support, a healthcare professional may use the verse to affirm hope without promising a particular medical outcome. The professional might say, “Your faith appears important to you. Would it be helpful if I sat with you, prayed, or contacted the chaplain?” This approach respects consent. Spiritual care should never imply that insufficient faith caused the injury or that prayer can replace evidence-based treatment.

Hope Without False Reassurance

Hope can be directed toward many meaningful goals: the child’s recovery, comfort, skilled care, family strength, clarity in decisions, or peace during uncertainty. Saying “everything will be fine” may feel dismissive when the prognosis is unknown. Romans 15:13 can support presence and trust without denying fear. A clinician can acknowledge, “This is frightening, and you do not have to face it alone.” Honest information and compassionate spiritual support reinforce rather than oppose each other.

Respect for Diverse Beliefs

Future healthcare professionals serve families with varied religions and none. The verse should be offered only when consistent with the family’s stated beliefs or request. For a different faith, staff may contact an appropriate spiritual leader; for a nonreligious family, sources of meaning may include relationships, values, nature, culture, or community. Patient-centered spiritual care begins by asking what gives the family strength. The professional’s personal belief should not control the encounter.

Conclusion

Mr. X's acute stress response activates sympathetic catecholamines and the HPA axis, increasing alertness, cardiovascular output, ventilation, and energy availability. Epinephrine and adrenaline are the same substance, while norepinephrine, cortisol, and endogenous opioids have distinct roles. If fear produces hyperventilation, loss of carbon dioxide can cause acute respiratory alkalosis and symptoms such as tingling and lightheadedness. During his son's hospitalization, prolonged stress may affect sleep, digestion, blood pressure, pain, attention, and mood. Parents need scheduled hydration, ordinary balanced nutrition, rest, movement, and medical assessment when symptoms arise; oral rehydration solution is reserved for actual fluid loss or clinical need. Romans 15:13 may be used respectfully to support Christian parents when they consent, joining realistic hope with honest medical care.

References

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