Professional Development

Anxiety

Anxiety

This self-study is all about anxiety. We will be using a number of case studies to illustrate some important concepts. The key objective is to illustrate how anxiety can add complexity to paramedic assessments and choices related to interventions. We will include some information related to anxiety, definitions and statistics, but let us start with an introduction to the case studies.

Some literary creativity has been taken, and there are enough details altered and omitted to satisfy PHIPPA. The scenarios will be briefly introduced, and later deconstructed once some additional information about anxiety has been discussed.

Let's get started

You and your partner have barely made it through the door of the station when the tones go off. Code 4, difficulty breathing.

The patient is 14, female, and she is hyperventilating. Aliyah is breathing deeply and quickly. As well, she is crying, holding her abdomen, and retching into a bucket between her feet. She has no diagnosed medical problems and takes no routine medications. Her mom arrives moments after you do. She tells you that Aliyah has seen doctors and specialists, has had blood tests, but does not have a diagnosis to explain these episodes, which have been occurring intermittently for several months. You also learn that yesterday the boy that Aliyah had a crush on, has asked her best friend to the prom, and today there is a math test that she is unprepared for……

The next call is a code 4 shortness of breath.

A 58 year old woman, Kathleen, is complaining that she is having trouble catching her breath. She is nervously twisting the ring on her finger and is telling you she feels like she might die. This strikes you as incongruent with the very fit pilates instructor standing in front of you. Her breath sounds are clear and she denies having any chest pain. She tells you that she did experience panic attacks back in her twenties, following the stillborn loss of her second child, but has not experienced panic for the past thirty years……

Your third call of the day is to a retirement residence for a "generally unwell male".

This call is for a 73 year old man, Ben, who is agitated and angry at his meddling daughter for calling 911. He appears to be anxious, tachypneic, and diaphoretic. He has a history of Generalized Anxiety Disorder and has a prescription for the SSRI (selective serotonin reuptake inhibitor) Citalopram. His daughter states that he is often anxious, and perhaps is more upset today as he has been to 3 funerals for close friends in the past month……

OK, just one more call today. Code 4 for chest pain.

Skylar is 45, and hysterical as her husband Walter is being taken into police custody. Between sobs, she describes a choking sensation in her throat and palpitations. She is inconsolable and reaches into her purse for a shot of whiskey and some Valium……

So, what do these four scenarios have in common?

In each of them, anxiety plays a role. Each of the patients is showing signs of anxiety, hyperventilation, or panic, and each of them has a history that suggests that this could explain their current presentation.

Let us leave the case studies for a few minutes in order to better define what is meant by anxiety, and to determine the impact of anxiety on our assessments and interventions.

Anxiety is important to the human experience. Anxiety is a necessary force for survival as it provides motivation for achievement. It has been defined as "an emotional response (e.g. apprehension, tension, uneasiness) to anticipation of danger, the source of which is largely unknown or unrecognized". (Shahrokh & Hales, 2003)

So anxiety is a normal reaction to a danger or threat, and therefore the anxiety felt should quickly dissipate when the danger or threat is removed or is no longer present.

"Anxiety may be regarded as pathologic when it interferes with effectiveness in living, achievement of desired goals or satisfaction, or reasonable emotional comfort". (Shahrokh & Hales, 2003)

An anxiety disorder, however, involves an excessive or inappropriate state of arousal characterized by feelings of apprehension, uncertainty, or fear. The word is derived from the Latin word, *angere*, which means to choke or strangle. The anxiety response can occur without the trigger of an external threat or danger. Nevertheless it can still paralyze the individual into inaction or withdrawal. (Sobnosky, 2014)

What then is the difference between normal and abnormal anxiety? This can be challenging to define as what is `normal` is determined by societal standards. However, there are some generally agreed upon criteria to consider when determining if an anxiety can be seen as abnormal. They are:

1. Is it out of proportion to the situation that is creating it?
2. Is the anxiety interfering with social, occupational, or other important areas of functioning?

(Townsend, 2012)

So, anxiety can be rather normal, say, when one accidentally stumbles near a venomous snake. To create the experience we call

anxiety, multiple parts of the brain are stimulated:

The ***Amygdala***, part of the primitive brain we share with all animals, mediates a primary fear response. Some evidence suggests that the amygdala in people with anxiety disorders may be highly sensitive to new or unfamiliar situations and reacts with a high stress response. (Sobnosky, 2014)

The ***Hippocampus*** remembers the fear responses and plays an important role in the future responses to real or perceived threats.

The ***Brain Stem*** accelerates respiration and heart rate.

The ***Hypothalamus*** activates the stress response, including the release of the stress hormone cortisol.

The ***Frontal Cortex*** provides the cognitive interpretations of the event (Hmmm, let me see, that is a venomous snake. I should endeavour to move myself from its path).

The ***Thalamus*** integrates the sensory stimuli (It looks like a snake, it sounds like a snake...).

The ***Basal Ganglia*** is responsible for the tremors one often experiences with anxiety.

The brain coordinates an appropriate response to this anxiety-provoking situation, and you step away from the snake.

Of course, for the brain to pull together this helpful response to the snake there has to be communication between the various areas of the brain. This is accomplished by way of the chemical messengers in the brain or neurotransmitters. Multiple neurotransmitters are involved, but the major players are dopamine, serotonin, norepinephrine, and gamma-aminobutyric acid (GABA). (Townsend, 2012)

These neurotransmitters are instrumental in the experience of anxiety, whether it is a normal healthy response to a situation, or a disordered response.

When a threat is present, anxiety plays a role in helping us to survive. However, in the absence of a danger or threat, anxiety may also be experienced. This can cause significant interference in a person's day to day life and is considered a disorder. What causes anxiety disorder?

Current research points to a combination of biological, psychological and environmental factors. Most people with these disorders seem to have a biological vulnerability to stress, making them more susceptible to environmental stimuli than the rest of the population.

Studies also suggest that an <u>imbalance</u> of certain *neurotransmitters* may contribute to anxiety disorders. The neurotransmitters targeted in anxiety disorders are the ones mentioned previously, GABA, serotonin, dopamine, and norepinephrine.

Some of the current thinking in mental health research involves an imbalance of these neurotransmitters as an explanation

for an unhealthy or disabling experience of anxiety.

Serotonin: is thought to be decreased in anxiety disorders. Serotonin appears to be specifically important in feelings of well-being, and deficiencies are highly related to anxiety and depression. Stress hormones such as cortisol also play a role. (Hoge, Ivkovic, & Fricchione, 2012)

Norepinephrine: is thought to be increased in anxiety disorders.

GABA: is thought to be decreased in anxiety disorders (GABA is the major neuroinhibitory neurotransmitter, so reduced levels allow for increased cellular excitability).

The prevalence of anxiety disorders is about 12% in Canada according to the Canadian Mental Health Association. The umbrella of anxiety disorders includes phobias, panic disorder, post-traumatic stress disorder and obsessive-compulsive disorder.

All types of anxiety disorders can be very debilitating and seriously affect a person's quality of life. (Sobnosky, 2014)

Table 1. Characteristics of Anxiety Disorders

Anxiety Disorder	Characteristics
Separation anxiety	Often develops in childhood nut may continue into adulthood. Excessive fear and/or anxiety about separation from attachment figures
Selective mutism	Consistent failure to speak in social situations when there is an expectation to speak
Specific phobia	Fear, anxiety, avoidance of specific objects or situations
Social anxiety disorder (SAD; social phobia)	Fear, anxiety, avoidance of social interactions, Cognitive ideation is of negative evaluation by others
Panic disorder	Experiences recurrent unexpected panic attacks and is persistently anxious about having more attacks. May change behaviours in an effort to avoid panic attacks. May be a marker of disease severity for other disorders
Agoraphobia	Fearful and anxious about public transportation, open spaces, enclose places, standing in line, being in a crowd, and/or being alone outside of the home
Generalized anxiety disorder (GAD)	Persistent and excessive anxiety and worry about various event and activities. Physical symptoms include restlessness, feeling on edge, being easily fatigued, having difficulty concentrating irritability, muscle tension, and sleep disturbance
Drug-induced anxiety disorder	Anxiety occurs due to the presence of absence of a substance or medication
Anxiety due to another medical condition	Anxiety symptoms are the result of physiological consequences of another medical condition

Source: Reference 2

Table 1 (Characteristics of Anxiety Disorders)

Case Study #1

Ok, with these insights, let's return to our patients, beginning with Aliyah. She was the teenager who was hyperventilating.

Is she a person with risk factors for an anxiety disorder? Our current understanding of the risk factors is as follows:

- ***Gender*.** With the exception of obsessive-compulsive disorder (OCD), women have twice the risk for most anxiety disorders as men.
- ***Age*.** Phobias, obsessive compulsive disorder, and separation anxiety typically show up early in childhood, while social phobia and panic disorder often develop during the teen years.
- ***Traumatic Events*.** Traumatic events can trigger anxiety disorders, particularly post-traumatic stress disorder.
- ***Medical Conditions*.** Although causal relationships have not been established, certain medical conditions have been associated with increased risk of panic disorder. They include migraines, obstructive sleep apnea, mitral valve prolapse, irritable bowel syndrome, chronic fatigue syndrome, and premenstrual syndrome.

(Stein & Stein, 2008)

Those medical conditions in particular may have come as a bit of a surprise. Who would have guessed that there is a correlation between mitral valve prolapse and anxiety?

This correlation offers a really good opportunity to reinforce one of the key objectives of this self-study guide.

Not only is the goal to enrich our existing knowledge about anxiety, but to continue to reinforce the importance of performing comprehensive physical assessments and the determination of medical problems that may benefit from pre-hospital intervention. If we get tunnel vision around the presentation of anxiety, we may miss important opportunities to understand our patients' true underlying medical situation

As an example, occasionally patients who call for paramedic services with chest pain, and who have a low-to-moderate risk for a heart attack, are actually suffering from panic attacks. It is often difficult even for specialists to distinguish between a heart condition and a panic attack:

- Women who are having an actual heart attack or acute heart problem are much more likely to be misdiagnosed as having an anxiety attack than are men with similar symptoms.
- Mitral valve prolapse, a common and usually mild heart problem, may have symptoms that are nearly identical to those of panic disorder. *The two conditions, in fact, frequently occur together.*

(Sobnosky, 2014)

Mitral valve prolapse keeps popping up here, so let's take a moment to better understand what it is.

Mitral valve prolapse is a disorder in which the mitral valve does not close properly when the heart contracts. When the valve does not close properly it allows blood to backflow into the left atrium.

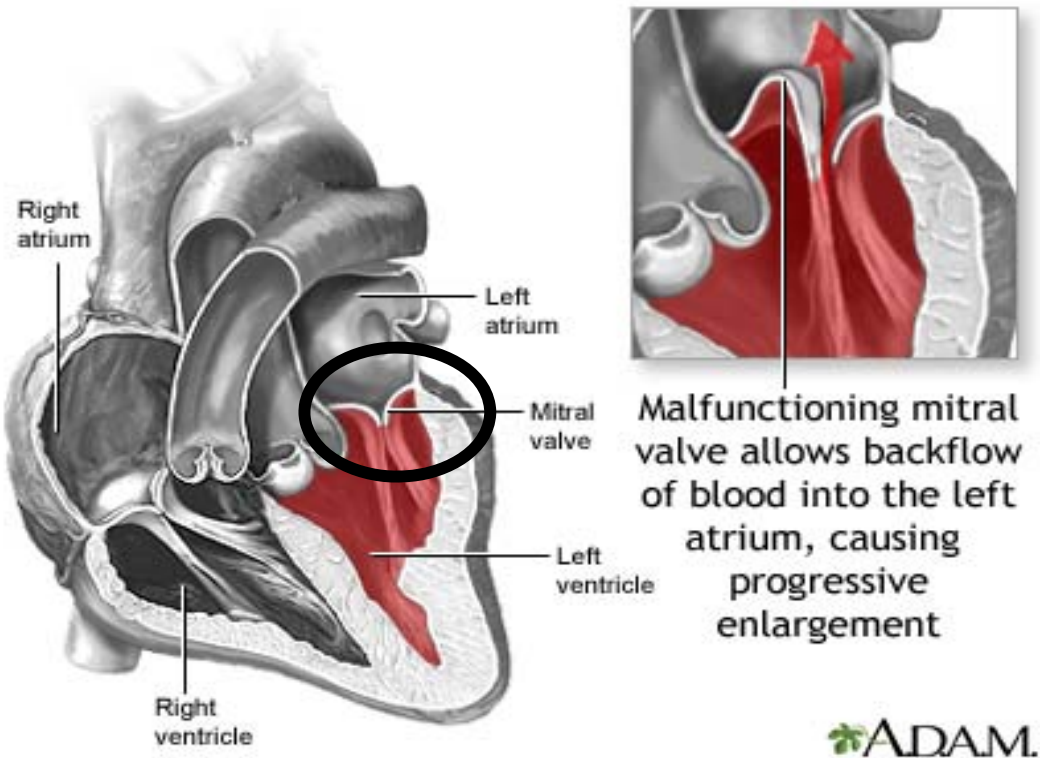

Figure 1 (Mitral Valve Prolapse n.d.)

Some symptoms can include palpitations, chest pain, difficulty breathing after exertion, fatigue, cough, and shortness of breath while lying down.

Mitral valve prolapse isn't the only medical problem that can generate anxiety-like symptoms. These medical conditions include hypoglycemia, recurrent pulmonary emboli, and adrenal-gland tumors. Women can also experience intense anxiety attacks with hot flashes during menopause.

In addition, there are side effects from medications that can produce anxiety. These include medications for common conditions such as hypertension, diabetes, and hypothyroidism.

Anxiety reactions also occur in people who are withdrawing from medications used to treat sleep disorders or anxiety.

It is not unusual for people with anxiety disorders to drink alcohol or misuse drugs in order to conceal or eliminate symptoms, but substance abuse and dependency can also cause anxiety. In addition, withdrawal from alcohol can produce physiologic symptoms similar to panic attacks. Clinicians often have difficulty determining whether alcoholism or anxiety is the primary disorder.

Overuse of caffeine or abuse of amphetamines can cause symptoms resembling a panic attack. (Sobnosky, 2014)

So when a patient is presenting with what looks like "just" anxiety, it is essential that we explore the situation with greater depth and are comprehensive in our physical assessments and history taking.

Returning to Aliyah, we noted that she is hyperventilating.

As she hyperventilates, breathing quickly and deeply, she is actively exhaling carbon dioxide at a faster rate than it is being produced by aerobic cellular respiration. Her ETCO2 will therefore drop below the normal range of 35mmHg to 45mmHg. Typically the prognosis for hyperventilation is good; however there are occasions of post-hyperventilation apnea and even death. In a case report referred to by Munemoto et al, one patient experienced a period of post-hyperventilation apnea lasting 3.5 minutes. It is therefore essential that one is prepared to actively resuscitate the hyperventilating patient.

It is also important to consider that hyperventilation comes with additional complications.

"Hyperventilation, that is common in panic disorders, provokes an increase of cardiac output and contractility and it is a well-known precipitant for coronary spasm that can lead, in turn, to ventricular arrhythmias and myocardial infarction, and also to the rupture of atherosclerotic plaque, both in known coronary patients and in healthy people" (Tennant & McLean, 2001)

At this point some people think about paper bags, the idea of rebreathing carbon dioxide from a paper bag in order to restore normal ETCO2. A look at the related literature suggests that the effectiveness of the paper bag method is not clear, and the risk of hypoxia, collapse and death increases, therefore it is *not advised*. (Munemoto, Masuda, Nagai, Tanka, & Yugi, 2013)

As it turns out, with Aliyah we need to consider some of the biases that we may face. She is a young female who is hyperventilating, but here is the important part and really the focus of this self-study package. If we see anxiety or hyperventilation as our working diagnosis, we risk missing other important underlying medical problems.

It is safer and more appropriate to look at hyperventilation and anxiety as <u>symptoms</u> and not as the provisional diagnosis itself.

The information about the date for the prom and the math test could stop the paramedics responding to this call from further exploring the medical history and performing a comprehensive physical assessment.

In this case scenario, the patient was coached to breath into a paper bag, and a discussion about coping took place with mom and Aliyah. As she felt a little better, transport was refused, but not long after, the symptoms returned and mom drove

Aliyah to Sick Kid's where Aliyah was diagnosed with ovarian torsion and had emergency surgery to correct it.

While there is no expectation that we are diagnosing ovarian torsion in the pre-hospital environment, it is important to hold on to the knowledge that anxiety, panic and hyperventilation often present concurrently with other medical problems.

Case Study #2

On to Kathleen, the fit-looking 58 year old who was hyperventilating. Is this a panic attack? After all, research has determined that panic attacks happen with greater frequency after menopause. (Sobnosky, 2014)

According to the American Psychiatric Association, a panic attack is characterized by intense anxiety that has a sudden onset and is brief in duration. A person with panic attacks has a continual fear of experiencing future attacks and will shift their behaviour or activities to avoid these attacks. (2013)

As we assess Kathleen, we can recognize that a panic attack may explain today's experience, while looking further for other possibilities.

If your immediate thought is that the panic and hyperventilation are symptoms and not your provisional diagnosis, then you are on a good track.

Instead of assuming "panic attack" and focusing the line of questioning on the loss of her child 30 years ago, let's instead look at the pathophysiology behind why Kathleen is hyperventilating and feeling an impending doom today.

The physical assessment reveals tachypnea, and distension of the neck veins. When auscultating the chest, the heart sounds *seem* abnormal as there is a 3rd heart sound rather than the normal lub-dub. While enroute to hospital a secondary assessment was performed and in assessing the legs for pulses, colour, temperature, and sensation, you check for Homan's sign (see next page). Interestingly, it is positive on the left leg. A positive Homan's sign suggests that Kathleen may have a deep vein thrombosis, or DVT.

Together, these findings suggest the possibility of a pulmonary embolism. Kathleen may be hyperventilating to compensate for the hypoxemia resulting from a ventilation/perfusion mismatch.

Here is a helpful tip from the Merck Manual:

"Pulmonary embolism should be considered in the differential diagnosis of patients suspected of having….. Acute Anxiety with Hyperventilation" (Pulmonary Embolism, 2016).

Homan's Sign

If assessing for Homan's sign isn't currently a routine part of your physical assessment, here is a brief on the assessment:

- *To assess Homan's sign, the patient's knee is in an extended position and the examiner forcefully dorsiflexes the patient's ankle.*
- *A positive sign is indicated when pain in the popliteal region and the calf is elicited as the foot is dorsiflexed.*
- *A negative Homan's sign, on the other hand doesn't automatically conclude an absence of DVT. Thrombosis that develops in the thigh and pelvis veins are often difficult to detect and patients can often remain asymptomatic.*
- *Homan's test remains an important tool for use in the health care setting. Thus, it can be to our advantage to apply Homan's test in conjunction with other detected clinical symptoms correlated with DVT such as; unexplained fever or tachycardia, muscle pain, tenderness, swelling, temperature change and venous dilation.*

Figure 2 (Positive Homans Sign)

Following the secondary assessments, you acquire a 12 lead and it looks like this:

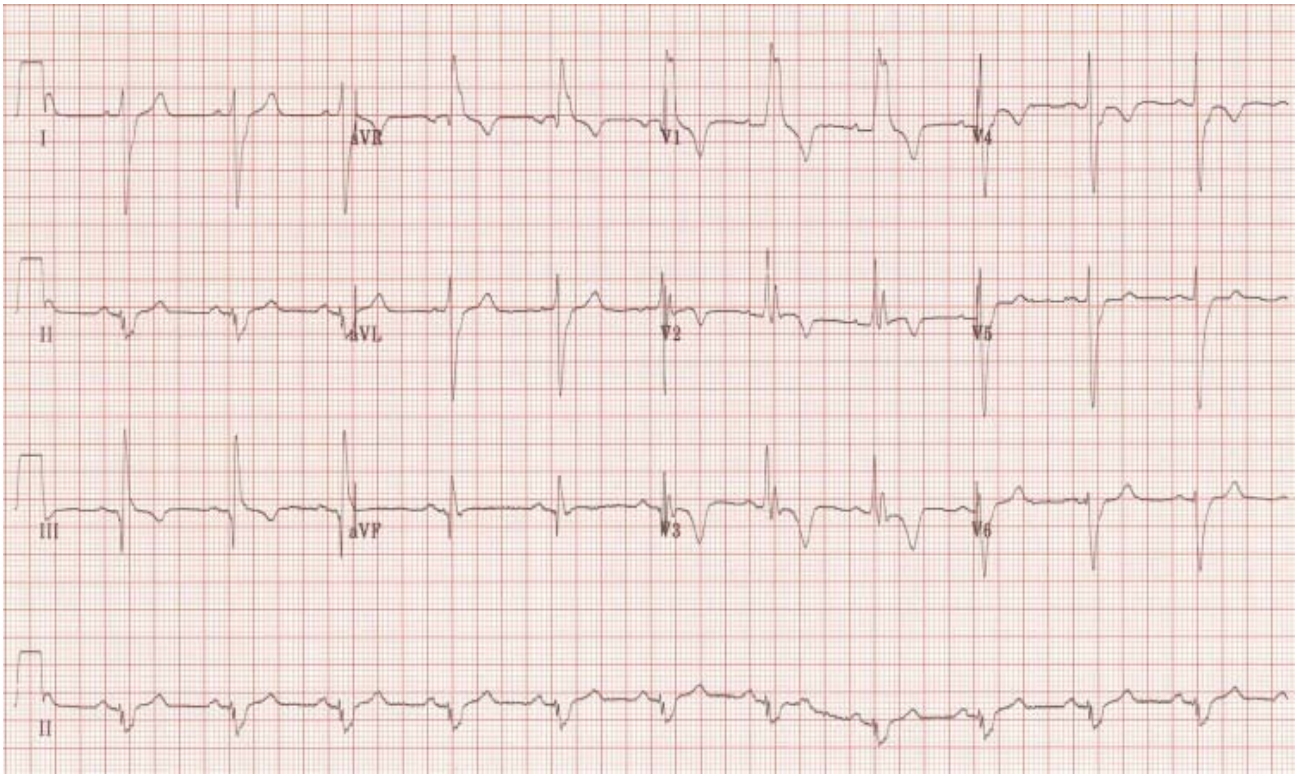

Figure 3 (Life in the Fast Lane Pulmonary Embolism)

- RBBB
- Extreme right axis deviation (+180°)
- S1 Q3 T3
- T-wave inversions in V1-4 and lead III
- Clockwise rotation with persistent S wave in V6

Now don't stress too much over this 12 lead. At this point, we are not going to get hung up on the role of the 12 lead when considering pulmonary embolism as these changes are neither entirely sensitive nor specific.

However, the fact that a 12 lead was performed and recognized as abnormal, is important.

Note that the right bundle branch has appropriate discordance relative to the ST segment, so we are not thinking of a STEMI when looking at this cardiogram.

Interestingly, the finding of the right bundle branch block is seen in about 18% of pulmonary embolisms and is associated with increased mortality. (Life in the Fast Lane Pulmonary Embolism)

So what happened with Kathleen?

Initially there was time spent on scene discussing the loss of the infant decades ago, and an exploration of whether cognitive behavioural therapy and medications may have helped her to work through the grief. With the exertion of moving to the stretcher, the patient began to look increasingly unwell, experiencing

chest heaviness and cyanosis, which prompted a brisker response to her care. High concentration oxygen was administered, the 12 lead (above) obtained and an IV initiated, with a fluid bolus as she became hypotensive.

Despite good pre-hospital interventions of oxygen, rapid transport, and IV for volume expansion, Kathleen arrived at ER significantly worse with cyanosis and hypotension. Within 20 minutes of arrival she experienced a PEA arrest. Autopsy showed a massive pulmonary embolism through both the left and right pulmonary arteries, called a saddle embolism.

It is easy in hindsight to acknowledge that she wasn't experiencing "just a panic attack".

Case Study #3

No surprises here. You have by now figured out that Ben appears to be anxious, but is ultimately going to also have a serious underlying medical problem.

Even with a history of Generalized Anxiety Disorder and a prescription for a SSRI, you managed to steer clear of tunnel vision and are committed to a comprehensive assessment of the patient.

Ben's crew used their assessment skills, including ETCO2 to develop a clinical index of suspicion for sepsis. They noted that the patient was afebrile, BP 98/50, and had a low ETCO2 of 31mmHg. The ETCO2 was low due to reduced perfusion, resulting in a reduced amount of blood returning to the alveoli for gas exchange. The crew recognized the emergent nature of Ben's presentation, provided oxygen and rapid transport. They also patched to the Base Hospital Physician to initiate a fluid bolus, recognizing that with sepsis, the patient's ability to maintain adequate circulation to major organs will be compromised.

With the early notification of the ER team, Ben's definitive treatment began quickly. His initial serum lactate level, a measure of anaerobic metabolism, was high at 4.2mmol/L. Ben recovered in the ICU and was able to return to his home.

Case Study #4

OK, confession time. The final case study isn't a real one drawn from calls done. Skylar's story was a rip from a popular TV series. This "case study" is being included to illustrate the correlation between emotional stress and the impact on the heart.

It turns out that it can be a bit tricky to differentiate between panic and Acute Coronary Syndromes (ACS). "To distinguish between a panic attack and an acute coronary syndrome is particularly complex, due to the overlapping of the clinical-symptomatic pattern" (Abrignani, Renda, Abrignani, Raffa, Novo, & Baido, 2014)

Looking at some of the symptoms:

Panic Disorders	Myocardial Ischemia
Palpitations	Palpitations
Sweating	Sweating
Chest pain or discomfort	Chest pain or discomfort
Nausea	Nausea

These overlaps are so entrenched that historically what we now call a panic disorder was previously known as "cardiac neurosis, irritable cardiac syndrome, or soldier's heart"

(Abrignani, Renda, Abrignani, Raffa, Novo, & Baido, 2014)

The above symptoms don't give us a good indication as to whether Skylar is experiencing an acute coronary syndrome or not, but we do need to be vigilant. According to a meta-analysis, "emotional stress precedes a myocardial infarction in 7% of cases, especially in women" (Culic, Eterovic, & Miric, 2005)

In related research, there is found to be a correlation between panic and sudden death, and the suggestion that panic may be one of the main precipitators of lethal dysrhythmias. (Abrignani, Renda, Abrignani, Raffa, Novo, & Baido, 2014)

The impact of strong emotion on the heart is so strong that it may result in changes to the electrocardiogram and the release of troponin even in the absence of atherosclerotic lesions in the coronary arteries. This is described as Takotsubo cardiomyopathy, and the pathophysiological mechanisms are not yet well understood.

(Abrignani, Renda, Abrignani, Raffa, Novo, & Baido, 2014)

Your finding of anxiety or panic is certainly part of your assessment, but it is important to continue with a comprehensive physical assessment, knowing that emotional distress has a strong correlation with other treatable findings.

Wrap up

Anxiety, and associated panic and hyperventilation, are frequently seen in the pre-hospital environment. The underlying causation is likely to be interplay of physical, psychological and environmental factors. It is important to remember that a variety of medical problems present with anxiety as one of the symptoms. When one avoids tunnel vision, and ensures that history taking is complete and the physical assessment is comprehensive, one is well-positioned to deliberate on the possible treatable causes and deliver the optimal pre-hospital care.

While this self-study has focused on a review of anxiety and some of the concurrent medical illnesses that can present and be overshadowed by anxiety,

there is much more that can be explored. The following bibliography provides the sources to the information in the preceding document and contains more extensive information that are recommended readings to reinforce your knowledge of anxiety.

Once you are ready, please proceed to the questions portion of this self-study.

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