

## **NURS 6501**

### **Knowledge Check: Module 5**

#### **Student Response**

This Knowledge Check reviews the topics in Module 5 and is formative in nature. It is worth 20 points where each question is worth 1 point. You are required to submit a sufficient response of at least 2-4 sentences in length for each question.

#### ***Scenario 1: Gout***

A 52-year-old obese Caucasian male presents to the clinic with a 2-day history of fever, chills, and right great toe pain that has gotten worse. Patient states this is the first time that this has happened, and nothing has made it better and walking on his right foot makes it worse. He has tried acetaminophen, but it did not help. He took several ibuprofen tablets last night which did give him a bit of relief. Past medical history positive or hypertension treated with hydrochlorothiazide and kidney stones. Social history negative for tobacco use but admits to drinking “a fair amount of red wine” every week. General appearance: Ill appearing male who sits with his right foot elevated. Physical exam remarkable for a temp of 101.2, pulse 108, respirations 18 and BP 160/88. Right great toe (first metatarsal phalangeal [MTP]) noticeably swollen and red. Unable to palpate to assess range of motion due to extreme pain. CBC and Complete metabolic profile revealed WBC 14,000 mm<sup>3</sup> and uric acid 8.9 mg/dl. The APRN diagnoses the patient with acute gout.

#### **1 of 2 Questions:**

*Describe the pathophysiology of gout.*

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Gout occurs as a response to the presence of monosodium urate (MSU) crystals in joints, bones, and soft tissues. An elevated serum urate level, together with complex metabolic, genetic, and other local factors, can result in the deposition of urate crystals into the joints. Once deposited into a joint, the crystals can be released into the joint space and initiate an inflammatory cascade causing acute gouty arthritis. These acute flares resolve, but the crystals remain in the joint, resulting in the symptoms experienced by the patient in this scenario, such as right great toe pain.

**2 of 2 Questions:**

*Explain why a patient with gout is more likely to develop renal calculi.*

Persons with gout, such as in the case of the patient in this case scenario have a higher risk for uric stone acid formation as a result of the low urine pH that establishes an environment favorable for uric acid precipitation. The acid precipitation increases the risk of calcium oxide stone formation which leads to renal calculi in the kidney.

**Scenario 2: Lyme Disease**

Stan is a 45-year-old man who presents to the clinic complaining of intermittent fevers, joint pain, myalgias, and generalized fatigue. He noticed a rash several days ago that seemed to appear and disappear on different parts of his abdomen. He noticed the lesion below this morning and decided to come in for evaluation. He denies recent international travel and the only difference in his usual routine was clearing some underbrush from his back yard about a week ago. Past medical history non-contributory with exception of severe allergy to penicillin resulting in hives and difficulty breathing. Physical exam: Temp 101.1 °F, BP 128/72, pulse 102 and regular, respirations 18. Skin inspection revealed a 4-inch diameter bull's eye type red rash over the left

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flank area. The APRN, based on history and physical exam, diagnoses the patient with Lyme Disease. She ordered appropriate labs to confirm diagnosis but felt it urgent to begin antibiotic therapy to prevent secondary complications.

**Question:**

*What is Lyme disease and what patient factors may have increased his risk developing Lyme disease?*

Lyme disease refers to an infectious tick-borne illness resulting from infection by bacteria known as *Borrelia burgdorferi*. This disease manifests itself through rashes, fever, chills, headache, fatigue, muscle and joint pain, and swollen lymph nodes. The patient factors that may have increased his risk of developing Lyme disease is his usual routine of clearing some underbrush from his back yard, which exposed his skin to tick bites from ticks that might result in the underbrush in his backyard.

***Scenario 3: Osteoporosis***

A 72-year-old female was walking her dog when the dog suddenly tried to chase a squirrel and pulled the woman down. She tried to break her fall by putting her hand out and she landed on her outstretched hand. She immediately felt severe pain in her right wrist and noticed her wrist looked deformed. Her neighbor saw the fall and brought the woman to the local Urgent Care Center for evaluation. Radiographs revealed a Colles' fracture (distal radius with dorsal displacement of fragments) as well as radiographic evidence of osteoporosis. A closed reduction of the fracture was successful, and she was placed in a posterior splint with ace bandage wrap and instructed to see an orthopedist for follow up.

**Question:**

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*What is osteoporosis and how does it develop?*

Osteoporosis is a medical condition in which the bones become brittle and fragile from the loss of tissues, typically as a result of hormonal alterations, or lack of calcium or vitamin D. The condition develops when bone development does not keep up with old bone removal, thus making the bones weak and brittle. The bones lose mineral like calcium faster than the body can replace them, making them less dense, lose strength and break more easily as seen in the case scenario patient whose wrist easily deformed when she tried to support herself to prevent a fall.

***Scenario 4: Rheumatoid Arthritis***

A 42-year-old woman presents to the clinic with a four-month history of generalized joint pain, stiffness, and swelling, especially in her hands. She states that these symptoms have made it difficult to grasp objects and has made caring for her 6 and 4-year-old children problematic. She admits to increased fatigue, but she thought it was due to her stressful job as well as being a single mother. No significant past medical history but recalls that one of her grandmothers had “crippling” arthritis. Physical exam remarkable for bilateral ulnar deviation of her hands as well as soft, boggy proximal interphalangeal joints. The metatarsals of both of her feet also exhibited swelling and warmth. The diagnosis for this patient is rheumatoid arthritis.

**Question:**

*Explain why patients with rheumatoid arthritis exhibit these symptoms and how does it differ from osteoarthritis?*

Patients with rheumatoid arthritis exhibit the symptoms like the ones in this case scenario because the body's immune system continuously and mistakenly attacks the healthy tissues, affecting the lining of the joints and cause pain in different parts of the body. The attack also

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causes the joints to become stiff and swell. However, the difference between rheumatoid arthritis and Osteoarthritis is the cause behind the joint symptoms. Whereas rheumatoid arthritis is an autoimmune disease in which the body's own immune system attacks the body's joints, the symptoms in Osteoarthritis are caused by mechanical wear and tear on the joints. As the patient stated, she inherited the autoimmune disease from her grandmother, who had crippling arthritis.

***Scenario 5: Ankylosing Spondylitis (AS)***

A 32-year-old Caucasian male presents to the office with complaints of back pain, stiffness, especially in the morning, interrupted sleep due to pain, and difficulty in leaning over to tie his shoes. The patient first noticed these symptoms about 6 months ago but attributed them to his weekend basketball team's games. He said he is exhausted due to sleep interruption. He has taken acetaminophen with some relief but says the naproxen seems to be working better. Married with 2 small children and works as a bank manager. Physical exam: Lungs clear but decreased chest excursion noted as well as decreased range of motion of hips and forward flexion, rotation, and lateral flexion restricted. Spine radiographs in the office revealed a slight kyphosis along with ankylosis at L5-S1. The APRN suspects the patient may have ankylosing spondylitis (AS). The APRN orders laboratory tests including an HLA-B27.

**Question:**

*Why did the APRN order an HLA-B27 lab? How would that lab result assist in understanding what ankylosing spondylitis?*

The APRN ordered an HLA-B27 lab to help in strengthening or confirming a suspected diagnosis of ankylosing spondylitis (AS). Ankylosing spondylitis is a form of arthritis that features chronic inflammation of the spine and sacroiliac joints. The HLA-B27 lab is crucial in understanding AS because the absence of HLA-B27 implies that the patient has other forms of

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arthritis other than AS. At the same time, its presence means that the patient has AS, reactive arthritis, juvenile rheumatoid arthritis (JRA), or anterior uveitis. People with the HLA-B27 gene are at high risk of developing AS. The patient is possibly suffering from AS because his symptoms such as back pain, stiffness, interrupted sleep due to pain, and difficulty in learning are associated with AS.

### ***Scenario 6: Lateral Epicondylitis***

A 17-year-old male presents to the clinic with a chief complaint of pain in his right elbow. He says the pain is sharp, especially with pronation and supination. He noticed the pain several weeks ago after his tennis team went to a regional competition. When he rests, the pain seems to go away. The pain is alleviated when he takes Naprosyn. No history of trauma or infection in the elbow. Past medical and social history non contributary. He is a junior at the local high school and just started taking tennis lessons 2 months ago and his coach is working with him on his backhand serve. Focused physical exam revealed point tenderness over the lateral epicondyle which increases with pronation and supination. The APRN diagnoses him with lateral epicondylitis and orders a wrist splint to prevent wrist flexion.

#### **Question:**

*Why did the APRN feel a wrist splint would be helpful? What patient characteristics lead to this diagnosis.*

The APRN feels that a wrist splint would be helpful because it would prevent unwanted flexion and extension of the wrist while permitting unrestricted movement of the fingers and thumb. The patient's characteristics that led to the diagnosis was the sharp pain wrist pain, especially with pronation and supination after the patient participated in tennis.

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### ***Scenario 7: Status Epilepticus***

A 24-year-old Caucasian male was brought to the Emergency Room (ER) by Emergency Medical System (EMS) after suffering a “convulsion” episode at work that didn’t stop. Upon arrival to the ER, the patient was noted to be actively seizing with tonic-clonic movements. The patient’s boss accompanied him to the ER and gave a statement that the patient appeared in his usual good health earlier in the morning when they started working at their jobs in an auto parts store. The boss didn’t know of any past medical history. The boss brought along the patients next of kin information, and the patients mother told the ER that the patient has a prior history of seizures but hadn’t had a seizure in several years. The family thought he had “outgrown them.” Past medical history, other than previous seizures, and social history non-contributory. No history of alcohol or drug abuse and had no history of vaping. The ER APRN diagnoses the patient with status epilepticus and along with the ER staff, initiated appropriate treatment.

#### **Question:**

*What is a seizure and why is status epilepticus so dangerous for patients?*

A seizure refers to a sudden, uncontrolled electrical disturbance in the brain. A seizure can result in changes in the behavior, movements, or even feelings and consciousness levels, as seen in the patient was actively seizing with tonic-clonic movements. However, when the seizure moves to the status epilepticus, it can be life-threatening, especially if treatment is delayed. The patient risks acquiring serious brain complications such as trauma, infections, or even stroke.

### ***Scenario 8: Multiple Sclerosis (MS)***

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A 32-year-old white female presents to the Urgent Care with complaints of blurry vision and “fuzzy thinking” which has been present for the last several weeks or so. She works as an executive for an insurance company and put her symptoms down to the stress of preparing the quarterly report. Today, she noticed that her symptoms were worse and were accompanied by some fine tremors in her hands. She has been having difficulty concentrating and has difficulty voiding. She remembers her eyes were bothering her a few months ago and she went to the optometrist who recommended reading glasses with small prism to correct double vision. She admits to some weakness as well. No other complaints of fevers, chills, upper respiratory tract infections, or urinary tract infections. Past medical and social history noncontributory. Physical exam significant for 4<sup>th</sup> cranial nerve palsy. The fundoscopic exam reveals edema of right optic nerve causing optic neuritis. Positive nystagmus on positional maneuvers. There are left visual field deficits. There was short term memory loss with listing of familiar objects. The APRN tells the patient that she will be referred to a neurologist due to the high index of suspicion for multiple sclerosis (MS).

**Question 1 of 2:**

*What is multiple sclerosis and how did it cause the above patient's symptoms?*

Multiple sclerosis is a progressive, immune-mediated disorder in which the body's immune system attacks the protective sheath or myelin that covers nerve fibers and causes communication breakdown between the brain and the rest of the body. In the above patient, multiple sclerosis caused optic neuritis that resulted in the symptoms such as of blurry vision and fuzzy thinking.

***Scenario 9: Myasthenia Gravis (MG)***

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61-year-old male complains of intermittent weakness and muscle fatigue that has progressively worsened over the past month. He was an internationally known extreme mountain climber but now he says he has difficulty in getting his morning paper. Initially he thought his symptoms of profound leg weakness and fatigue were due to his age and history of injuries from mountain climbing. Over the past few months, he also reports having noticed “blurriness” when working on his antique train collection or reading for long periods of time. He has developed intermittent double vision that seems to be worse when reading at bedtime. He also reports an occasional “droopy” eye lid. Past medical and social history noncontributory. Physical exam reveals weakness of right extra ocular muscle (EOM) with repetition. There is positive nystagmus and symmetrical upper extremity weakness with fasciculations. Lower extremities within normal limits (WNL). The APRN suspects the patient has myasthenia gravis (MG).

**Question:**

*What is the underlying pathophysiology of MG? .*

Myasthenia gravis is an autoimmune disease of neuromuscular junction that is caused by antibodies that attack components of the postsynaptic membrane, impair neuromuscular transmission, leading to weakness and fatigue of the skeletal muscle as noted in the case scenario patient. The patient complained of intermittent weakness and muscle fatigue that has progressively worsened.

***Scenario 10: Alzheimer’s disease (AD)***

A 67-year-old male presents to the clinic along with his family with a chief complaint of having problems with his short-term memory. His family had dismissed these problems and attributed them to the aging process. Over time they have noticed changes in his behavior, along with increased confusion and difficulty completing basic tasks. He got lost driving home

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from the bowling alley and had to be brought home by the police department. He is worried that he may have Alzheimer's Disease (AD). Past medical and social history positive for a minor cerebral vascular accident when he was 50 years old but without any residual motor or sensory defects. No history of alcohol or tobacco use. Current medication is clopidogrel 75 mg po qd. Neurological testing confirms the diagnosis of AD.

**Question:**

*What is Alzheimer's Disease and how does amyloid beta factor into the development and progression of the disease?*

Alzheimer's disease (AD) is a progressive form of dementia that causes problems with memory, thinking, and behavior as well as other essential mental functions. In this case scenario, the patient experienced issues with his short-term memory and changes in his behavior. The protein known as an amyloid-beta factor significantly participates in the development of AD. The protein destroys synapses before it clumps into plaques that lead to nerve cell death. The synapses are the connections between nerve cells, and once they are damaged, the patients may develop AD.

**Scenario 11: Spinal Cord Injury (SCI)**

A 22-year-old male was an unrestrained front seat passenger of a car traveling at 50 miles per hour. The driver swerved to avoid hitting a deer that darted in front of the car and hit a tree. The patient was ejected from the vehicle. He was awake and alert at the scene when the paramedics arrived, and his pupils were equal and reactive to light. He was placed in a hard-cervical collar per protocol and log rolled onto a long backboard. He was breathing spontaneously at the scene, but pulse oximetry in the EMS unit revealed a SaO<sub>2</sub> of 88% on room air. He was placed on 100%

oxygen via non-rebreather mask and was taken to a Level I trauma center with the following vital signs:

Vital signs: BP 90/50, Pulse 48 and regular, Respirations 24 and shallow with some use of accessory muscles, temp 95.2 F rectally. He was awake and answering questions appropriately but says he cannot feel his arms or legs. Glasgow Coma Scale 14. His skin was warm and dry with minor abrasions noted on his arms. According to family members, past medical history noncontributory and social history reveals only occasional alcohol use and no tobacco or vaping history. Full work up in the ED revealed a fracture-dislocation of C4 with assumed complete tetraplegia (formerly called quadriplegia). No other injuries noted. He was given several liters of IV fluid, but his blood pressure remained low.

**Question 1 of 2:**

*Explain the differences between primary and secondary spinal cord injury (SCI)?*

The primary spinal cord injury is caused by the mechanical disruption, transaction, or distraction of neural elements. On the other hand, secondary spinal injury is caused by a series of biological and functional changes such as vascular injury to the spinal cord caused by arterial disruption, arterial thrombosis, or even hypo-perfusion due to shock. For instance, the patient in this scenario suffered primary cord injury that resulted from fracture-dislocation of C4 as a result of the accident.

**Question 2 of 2:**

*What is spinal shock and how it is different from neurogenic shock?*

Spinal shock is a combination of areflexia or hypoperflexia and automatic dysfunction that accompanies spinal cord injury. Spinal shock differs from neurogenic shock in that,

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neurogenic shock describes the hemodynamic changes that result from a sudden loss of autoimmunity tone as due to spinal cord injury, whereas spinal shock is the loss of all sensation below the level of injury and is not circulatory in nature. In the case scenario above, the patient suffered a neurogenic shock because he was awake and alert at the scene when the paramedics arrived.

### ***Scenario 12: Traumatic Brain Injuries (TBIs)***

A 22-year-old male was an unrestrained front seat passenger of a car traveling at 50 miles per hour. The driver swerved to avoid hitting a deer that darted in front of the car and hit a tree. EMS on the scene noted a stellate fracture of the windshield on the passenger side. The patient was non-responsive at the scene when the paramedics arrived, and his pupils were unequal with the left pupil larger and sluggish to react to light. He was placed in a hard-cervical collar per protocol and log rolled onto a long backboard. He was breathing spontaneously at the scene, but pulse oximetry in the EMS unit revealed a SaO<sub>2</sub> of 78% on room air. He was intubated at the scene for airway protection and transported to a Level 1 trauma center. Glasgow Coma Scale=3

After a full trauma work up, the patient was diagnosed with an isolated traumatic brain injury with acute subdural hematoma secondary to coup-contrecoup mechanism of injury. He was emergently taken to the operating room for craniotomy after which he was taken to the Intensive Care Unit (ICU) for close monitoring. He had an intracranial bolt for measurements of his intracranial pressure (ICP).

#### **Question 1 of 2:**

*Explain the differences between primary and secondary traumatic brain injuries (TBIs)?*

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In traumatic brain injury, primary brain injury happens during the initial insult. It results from the displacement of the physical structure of the brain from external forces such as a blow to the head, as in the case of this patient who was hit by the windscreen. On the other hand, secondary brain injury can result from a tumor caused by primary injury or from a neurological illness such as stroke.

### **Question 2 of 2:**

*The APRN is called by the ICU staff because the patient's ICP has risen to 22 mmHg. The APRN recognizes the urgent need to lower the ICP. The APRN institutes measures to decrease the ICP and increase the cerebral perfusion pressure (CPP). What are the factors that determine CPP?*

Cerebral perfusion pressure (CPP), which is the flow of blood to the brain, is determined by several factors. The most critical factors include blood pressure and intracranial pressure. For instance, if the blood pressure is low or the intracranial pressure is high, the blood flow to the brain might be limited, thus causing cerebral CCP. In this patient, an elevated intracranial pressure that led to an increase in CCP.

### ***Scenario 13: Cerebral Artery Vascular Accident (CVA)***

An 83-year-old man presents with a history of atrial fibrillation (AF), hypertension, and diabetes. His daughter, who accompanied the patient, states that yesterday the patient had a period when he could not speak or understand words, and that approximately 4 weeks prior he staggered against a wall and was unable to stand unaided because of weakness in his legs. She states that both instances lasted approximately a half-hour. She was unable to persuade her father to go to the emergency room either time. Today he suffered another episode of right sided weakness,

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dysarthria, and difficulty with speech. Past medical history: Hypertension for 15 years, well controlled; diabetes for the past 10 years, and hyperlipidemia. Medications: Diltiazem CD 300 mg daily; lisinopril 40 mg daily; metformin 500 mg twice daily; aspirin 81 mg daily and atorvastatin 20 mg po qhs.

Social history: reported former smoker with 40 pack year history. Alcohol -drinks one beer a day. Denies any other substance abuse. Review of systems: Denies dyspnea, dizziness, or syncope; complains that he cannot move or feel his right arm or leg. Difficulty with speech.

Physical exam: Vitals: height = 70 inches; weight = 185 pounds; body mass index = 26.5; BP = 134/82 mm Hg; heart rate = 88 bpm at rest, irregularly irregular pattern.

HEENT remarkable for expressive aphasia, eyes with contralateral homonymous hemianopsia. No loss of sensation but unable to voluntarily move right arm or leg.

The patient was diagnosed with a right middle cerebral artery vascular accident (CVA) secondary to atrial fibrillation (AF)

**Question:**

*How does atrial fibrillation contribute to the development of a CVA?*

Cerebral artery vascular accident (CVA) is the sudden death of some brain cells as a result of lack of oxygen when blood flow to the brain is impaired by blockage or rupture of an artery to the brain. Atrial fibrillation is one of the risk factors for CVA. For instance, Atrial fibrillation such as clots, which often stay attached to the inner lining of the heart may break off, travel through the bloodstream, resulting in a plug in brain artery and cause the development of CVA. For instance, the case study patient presented with a history of atrial fibrillation (AF), which contributed to the development of CVA.

**Scenario 14: Osteoarthritis (OA)**

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A 57-year-old male construction worker comes to the clinic with a chief complaint of pain in his right hip. The pain has progressively gotten worse over the last 2 months and he has been having trouble sleeping. There is little pain in the morning, but he is a bit stiff. The pain increases as the day wears on. He has taken acetaminophen without any relief but states that the ibuprofen does work a little bit. He is anxious since the hip pain has limited his ability to work and he is afraid that his boss will fire him if he cannot perform his usual duties. There is no history of past trauma or infection in the joint. Past medical history noncontributory. Social history without history of alcohol, tobacco, or illicit drug use. Physical exam remarkable for decreased range of motion of the right hip. BMI 34 kg/m<sup>2</sup>. Radiographs in the office demonstrated asymmetrical joint space narrowing of the right hip with osteophyte formation. Several areas of the hip showed bone-on-bone contact with loss of the articular cartilage. The APRN tells the patient he has osteoarthritis (OA) and refers the patient to an orthopedist for evaluation of his need for a total hip replacement.

**Question:**

*Describe how osteoarthritis develops and forms and distinguish primary osteoarthritis from secondary arthritis.*

Osteoarthritis is related to aging and develops when the water content of the cartilage increases, and the protein makeup of the cartilage degenerates over time. Osteoarthritis forms as a result of repetitive use of joints over the years, thus damaging the cartilage, which results in joint pain and swelling.

Primary osteoarthritis (PO) is the wear and tear on the joints that result when people age. PO begins to show up between the ages of 55 and 60, even though, theoretically, everyone experiences cartilage breakdown as they age, with some cases being more severe than others. On

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the other hand, secondary osteoarthritis is caused by specific triggers such as injury, inactivity, genetics, inflammation, or obesity, which exacerbates the breakdown of cartilage. In the case scenario patient, he had a decreased range of motion of the right hip, resulting in secondary osteoarthritis.

### ***Scenario 15: Fibromyalgia (FM)***

A 34-year-old Caucasian female presents to the clinic with a chief complaint of widespread pain in her joints and muscles. She states that her skin seems sensitive and sometimes it hurts to be touched. She has had extreme fatigue for the past 4 months. She admits to being depressed and it unable to sleep well. She has had to drop out of her gardening club due to pain. She says that bright lights and loud noises really bother her. Past medical history noncontributory. Social history is significant for her divorce from her husband 14 months ago. She is the mother of 2 small children and works as an administrative assistant at the local insurance company. Physical exam remarkable for tender points over her posterior supraspinatus muscles, occiput, trapezius, gluteal area, and sacroiliac joints bilaterally. The APRN tells the patient that she most likely has fibromyalgia, based on her physical exam.

#### **Question 1 of 2:**

*What are the underlying causes of fibromyalgia?*

Fibromyalgia is a disorder that is characterized by widespread musculoskeletal pain accompanied by fatigue, sleep, memory, and mood problems. Fibromyalgia is caused by several factors such as genes that run in the family, trauma, stress resulting from emotional or physical abuse, anxiety, and depression, and restricted motion. In the case scenario patient, depression could be the probable cause of fibromyalgia.

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**Question 2 of 2:**

*The APRN tells the patient that the tender points are no longer used to diagnose FM. She suggests that the patient takes the Widespread Pain Index (WPI) and the Symptom Severity Inventory (SSI). The patient asks the APRN what these tests are for. What is the APRN's best answer?*

Widespread Pain Index (WPI) is the quantified extent of bodily pain on a scale of 0 to 19 in which the patient is asked if they have had pain in 19 different body regions which include “shoulder girdle, hip, jaw, upper arm, upper leg, lower arm, and lower leg on each side of the body, as well as the upper back, lower back, chest, neck, and abdomen” over the past week, with each painful or tender region given a score of 1 point. On the other hand, the Symptom Severity Inventory (SSI) is a scale in which the patients are asked to rate their pain experience by completing five items, that is “assessing pain frequency, duration, intensity, unpleasantness, or difficulty to endure” for three different locations, which include “temple, temporomandibular joint, masseter.”