Inside this issue:

From the Editor 1
Cert & CME info 2
FDNY contacts 3
OLMC physicians 3
CME Article/Quiz 4
Citywide CME

Exam Calendar

Journal CME Newsletter

FDNY - Office of Medical Affairs
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From the Editor

The Regional Emergency Medical Services has approved a revision to Appendix P: CPAP. The changes may be implemented immediately with a final date of implementation of August 1st, 2017. The revised Appendix P is included with this journal article.

Joshua Bucklan, RN, EMT-P
REMAC Liaison
Office of Medical Affairs, FDNY

**All candidates must now meet CME requirements**

- All REMAC paramedics and candidates should review Certification & CME Information on page 3 journal and plan accordingly.
- All upcoming exam candidates, see registration instructions at the bottom of the last page of this journal.
- Candidates who will not have a CME letter at the time of their REMAC exam must email Joshua.Bucklan@fdny.nyc.gov ASAP.
REMAC Exam Study Tips

REMAC candidates have difficulty with: REMAC Written exams are approximately:
* 12-lead EKG interpretation 10% BLS 15% Adult Trauma
* ventilation rates for peds & neonates 10% Adult Arrest 15% Pediatrics

Certification & CME Information

- By the day of their exam, all REMAC paramedics and candidates must present a letter from their Medical Director verifying fulfillment of CME requirements.
- Upcoming candidates without a CME letter ASAP must email Joshua.Bucklan@fdny.nyc.gov
- FDNY paramedics, see your ALS coordinator or Division Medical Director for CME letters.
- CME letters must indicate the proper number of hours, per REMAC Advisory # 2007-11:
  - 36 hours - Physician Directed Call Review
    - ACR Review
    - QA/I Session
    - Emergency Department Teaching Rounds - Maximum of 18 hours
  - 36 hours - Alternative Source CME - Maximum of 12 hours per venue
    - Online CME (see examples below)
    - Lectures / Symposiums / Conferences
    - Journal CME
    - Clinical rotations
    - Associated Certifications – 4 hours each:
      BCLS / ACLS / PALS / NALS / PHTLS
- Failure to maintain a valid NYS EMT-P card will suspend your NYC REMAC certification until NYS is recertified.

REMAC certification exams are held monthly for new and expired candidates, and for currently certified paramedics who may attend up to 6 months before their expiration date.

REMAC CME and Protocol information is available and suggestions or questions about the newsletter are welcome. Call 718-999-2671 or email Joshua.Bucklan@fdny.nyc.gov

          www.EMCert.com  www.WebCME.com
FDNY ALS Division Coordinators

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Introduction

The head is one of the most common sites of pain in the body. Pain may be in specific parts of the face or skull, or may be generalized involving the entire head. Headaches may arise spontaneously or may be associated with activity or exercise. It may have an acute onset or be chronic in nature, sometimes with episodes of increasing severity. Our focus in evaluating patients with headaches in the prehospital setting will be to maintain a high index of suspicion for life-threatening causes of headache. Certain “red flags” in the patient’s history of present illness will raise suspicion for these life-threatening causes.

Headaches, especially migraine headaches, result in missed workdays and medical costs approximating $50 billion a year. Migraines result in a marked decrease in quality of life and can cause varying degrees of disability. More than 90% of patients with migraine headaches have some degree of disability with their attacks, and half these patients require bed rest. Despite this high level of disability, fewer than 60% of patients with migraine have their headache diagnosed or treated.

Migraine Facts

- Nearly 1 in 4 U.S. households includes someone with migraine.
- 12% of the population – including children – suffers from migraine.
- 18% of American women, 6% of men, and 10% of children experience migraines.
- Migraine is most common between the ages of 25 and 55.
- Migraine tends to run in families. About 90% of migraine sufferers have a family history of migraine.
Classification

Headache is defined as a pain arising from the head or upper neck. The brain itself is not able to feel pain because there are no nerves within the brain capable of sensing pain. All headaches originate from other structures within the head and neck, including the following: the periosteum (thin layer of tissue that surrounds the bone), muscles that encase the skull, sinuses, eyes, ears, meninges (thin tissue that cover the surface of the brain and spinal cord), arteries, veins, and nerves. Headache pain varies widely and may be a dull ache, sharp, throbbing, constant, intermittent, mild, or intense.

In 2013, the International Headache Society released its latest classification system for headache. There are three major categories of headache based upon the source of the pain:

1. Primary headaches;
2. Secondary headaches;
3. Cranial neuralgias, facial pain, and other headaches.

The guidelines also note that a patient may have symptoms that are consistent with more than one type of headache, and that more than one type of headache may be present at the same time.

Primary headaches are by far the most common and include migraine, tension, and cluster headaches, as well as a variety of other less common types of headache.

- **Tension headaches** are the most common type of primary headache. Tension headaches occur more commonly among women than men. According to the World Health Organization, 1 in 20 people in the developed world suffer with a daily tension headache.

- **Migraine headaches** are the second most common type of primary headache. Migraine headaches affect children as well as adults. Before puberty, boys and girls are affected equally by migraine headaches, but after puberty, more women than men are affected.

- **Cluster headaches** are a rare type of primary headache. It more commonly affects men in their late twenties though women and children can also suffer this type of headache.

While these headaches are generally not life-threatening, they may be associated with symptoms that can mimic strokes. Although many laypeople equate severe headaches with migraines, the amount of pain does not determine the diagnosis of migraine.
Secondary headaches are those that are due to an underlying structural problem in the head or neck. This is a very broad group of medical conditions ranging from dental pain due to infected teeth or pain from an infected sinus, to life-threatening conditions such as bleeding in the brain or severe infections including encephalitis or meningitis. Headaches due to trauma also fall into this category, including post-concussion headaches. Substance abuse and excess use of medications typically used to treat headaches can cause medication overuse headaches. "Hangover" headaches fall into this category as well. People who drink too much alcohol may waken with a well-established headache due to the effects of alcohol and dehydration.

Neuralgia, or nerve pain, is another source of headache. Cranial neuralgia describes inflammation of one of the 12 cranial nerves that control the muscles and carry sensory signals (such as pain) to and from the head and neck. Perhaps the most commonly recognized example is trigeminal neuralgia, which affects the fifth cranial nerve, the trigeminal nerve. The trigeminal nerve is the main sensory nerve of the face, having three branches that carry sensations from the scalp, the area around the skull, as well as the face, eyes, mouth, neck, eyes, and ears, and can cause intense facial pain when irritated or inflamed.

Overall, the most common type of headache is tension headache, or tension-type headache (TTH). Symptoms include a feeling of pressure or tightness around the head. Women are more commonly affected than men are, and this kind of headache often begins during the teen years. TTH may be caused by musculoskeletal problems or stress. Attacks of TTH typically persist for a few hours, but in some cases can last for days. A chronic form of TTH can be disabling.

Common signs of tension headaches include:

- Pain that begins in the back of the head and upper neck and is often described as a band-like tightness or pressure. It may spread to encircle the head.
- The most intense pressure may be felt at the temples or over the eyebrows where the temporalis and frontal muscles are located.
- The pain occurs sporadically but can occur frequently and even daily in some people.
- The pain allows most people to function normally, despite the headache.

Muscle tension in the neck and neck pain can often lead to tension headaches and other spine issues. These headaches may develop due to emotional stress, working at a computer without adequate breaks, long periods of driving, poor sleeping positions or poor posture, among many other precipitants. The head weighs approximately twelve pounds. The muscles of the neck, primarily the sternocleidomastoid and the trapezius muscles, must counter the force of gravity to control positioning of the head and neck. When these muscles or the muscles that cover the scalp are stressed, they may become inflamed, go into spasm, and cause pain. Common sites include the base of the skull where the trapezius muscles insert, the temples (the temporalis muscles are attached to the mandible and the temporal bone), the muscles that move the jaw, and the forehead (frontalis muscle). Grinding of the teeth, either while awake or asleep, can cause strain on these muscles and lead to headaches.
Uncomfortable or painful neck tension may be reduced by neck stretches, using massage and heat, and by adjusting the daily routine. In addition to maintaining good posture, keeping your head up, shoulders back, sitting up straight, limiting repetitive activities when possible, and taking regular breaks during work and work outs will help prevent tension headaches.

Most people with tension headaches successfully treat themselves with over–the–counter (OTC) pain medications. Physical therapy, massage, biofeedback, and stress management can all be used as adjuncts to help with control of tension headaches.

Migraine

Migraine categories from the International Headache Society (IHS) include childhood period syndromes, migrainous infarction, and migraines with or without aura. These are detailed below. Migraine is a type of vascular headache. The blood vessels in the brain contract during the aura then dilate causing the headache. The aura is a sensation perceived by a patient that precedes a condition affecting the brain. An aura often occurs before a migraine or seizure. It may consist of flashing lights, a gleam of light, blurred vision, an odor, the feeling of a breeze, numbness, weakness, or difficulty in speaking. In some cases, an aura can occur with no headache.

Migraine without aura, or common migraine, makes up the largest number of cases and has at least two of the following characteristics:

- Unilateral location (occurs on one side of the body)
- Pulsating quality
- Moderate or severe intensity that inhibits or prohibits daily activities
- Aggravation by walking up stairs, or similar routine physical activity

Left untreated, the headache attacks last 4-72 hours; in children younger than 15 years, the headache may last 2-48 hours. During the headache, at least one of the following occurs: (1) nausea and/or vomiting or (2) photophobia (extreme sensitivity to light) and phonophobia (an intolerance or hypersensitivity to sound).

Migraine with aura, or classic migraine, has specific reversible neurologic symptoms that precede the actual headache and is seen less frequently. The headache characteristics are the same as those above. By definition, the aura is fully reversible and typically lasts 10 to 20 minutes, although it may continue for as long as 1 hour.
**Childhood periodic syndromes** are those that may be precursors to or associated with migraines. Migraine symptoms are somewhat different from those in adults; children may experience stomach pains (abdominal migraine), frequent and forceful vomiting (cyclical vomiting), or benign paroxysmal vertigo where the symptoms are unsteady balance, involuntary eye movements (nystagmus), vomiting, and behavioral changes.

**What is Nystagmus?**
- It is involuntary rapid and repetitive movement of the eyes
- Usually the movement is side-to-side (horizontal nystagmus)
- It can also be up and down (vertical nystagmus or circular (rotary nystagmus)
- The movement can vary between slow and fast and it usually involves both eyes

Patients with **migrainous infarction** (replaces complicated migraine) have migraine symptoms with aura. Their present attack is typical of previous attacks, but **neurologic deficits are not completely reversible within 7 days**, and/or neuroimaging demonstrates **ischemic infarction** in the relevant area.

By far, the most common type of migraine aura is **visual aura**. Almost 90 percent of people who suffer from migraine with aura experience a visual aura. This type of aura, as the name implies, causes a wide variety of vision changes and visual disturbances. These visual aura symptoms typically occur right before the full-scale migraine attack begins. Many people consider the visual aura symptoms a warning sign that the migraine is about to strike.

Just as migraine visual aura causes vision changes, **sensory aura** causes changes in the other senses. Sensory aura symptoms are typically short lived, lasting from a few minutes up to an hour. Most patients experience sensory aura symptoms gradually spreading from one part of the body to another. This is referred to as a “**march**” of symptoms. For example, the symptoms may begin in the tips of the fingers and slowly start to spread throughout the arm and then on to another body part. The symptoms of sensory aura usually include numbness, tingling and other “odd” sensations in the limbs, face or throughout the body.

The term “migraine” makes most people think of excruciating, debilitating head pain. While most migraine attacks do include severe head pain as a telltale symptom, some people experience **migraine aura without pain**. These episodes — which are still considered migraine attacks — are characterized and diagnosed by the aura; typically visual symptoms or changes in the other senses that resolve fully after a short while. Symptoms gradually build up over **five to 20 minutes** and then resolve completely within about an hour. However, what sets it apart from other types of migraines with aura is that there is **no head pain** within an hour of the aura symptoms. This condition is only diagnosed after a full evaluation after which no other disorder can be found for the symptoms.

Migraines occur in women about three times more often than in men and are often initiated or "triggered" by specific compounds or situations (environment, stress, hormones, and many others).

In addition, migraines more often occur in people with epilepsy, depression, stroke, asthma, anxiety, and in individuals with neurologic and hereditary disorders. In children, the incidence is about equal
in boys and girls until puberty when migraines become more common in girls. The peak intensity and frequency of migraines occur between ages of about 20 to 60 years of age. After 60, migraine intensity and frequency typically decrease and in some patients, migraines cease.

**Migraine-associated vertigo** consists of episodes of vertigo with or without headache. Vertigo is a specific type of dizziness that is defined as a spinning or rotatory sensation. Patients with vertigo feel like the room is rotating around them or that they are rotating around things. Vertigo could be from either a peripheral cause (the labyrinth, or inner ear, and vestibular nerve) or a central disorder (stroke or other disorders in the brain). **Central vertigo** is usually a result of an abnormal processing of the vestibular sensory nerve input by the central nervous system. The sensation of balance is the result of information detected by the vestibular, ocular, and proprioceptive sensory receptors that is then properly integrated within the cerebellum and brain stem. Proper gait, posture, and visual focus during head movement all depend on an intact sense of balance. Loss of sensory information, central integration, and output control mechanisms can all result in a sense of imbalance.

Migraine-associated vertigo symptoms can occur before the onset of headache, during a headache, or, as is most common, during a headache-free interval. Consequently, **many patients who experience migraines have vertigo or dizziness as the main symptom rather than headache**. Patients with migraine-associated vertigo often provide a long history of motion intolerance during car, boat, or air travel—or all three. Some patients are very sensitive to motion of the environment and to busy environments. **Vertigo**, which is an illusion of movement of the environment or of the patient in relation to the environment, is the most common type of dizziness reported, and it is present at some time in approximately 70% of patients. The attacks of vertigo may awaken patients and can be spontaneous or provoked by motion. Patients may or may not have a history of concurrent migraine headaches. In fact, most patients have dizziness symptoms during headache-free intervals or even numerous years following their last migraine headache. Some patients with migraine-associated vertigo have never experienced a migraine headache but have a family history of migraine.

**Migraine Triggers:** Migraine headaches are often triggered by the following circumstances:

- flashing lights
- anxiety and stress
- lack of food or sleep
- hormonal changes
- foods that contain tyramine (amino acid) *
- food additives (nitrites, aspartame and MSG) *
- aged cheese, wine, chocolate, smoked, cured or pickled meat, processed meats, tofu, some fruits and vegetables such as eggplant, avocado, bananas and raspberries

- changes in temperature
- strong smells
- strenuous exercise
- smoking
- caffeine (may cause or relieve headache)
The mechanism that triggers migraine headaches is unknown. Patients are urged to keep a headache diary, noting the foods they eat, stressful events, weather changes, and physical activity, to help identify patterns and avoid triggers. Some doctors like to estimate how migraines affect normal activities.

A questionnaire like the one below is given to the patient to estimate how often they miss various functions (school, work, family activities) because of migraines.

Prescription medications are available to abort or stop the migraine headache and treat the nausea and vomiting. Most patients with migraine headaches get some relief after resting in a dark room and falling asleep.

**A Case of Migraine with Aura**

Los Angeles reporter **Serene Branson** of CBS station KCBS-TV was reporting live from the 2011 Grammy Awards when she began having difficulty forming words. Her speech became garbled and she quickly realized that something was terribly wrong. Doctors explained that her condition had been caused by a "migraine with aura," with symptoms resembling those of a stroke (weakness, loss of vision, difficulty speaking and headache). This specific type of migraine was a **hemiplegic migraine**, and is associated with mutations of a specific gene. Researchers have found three genes linked with hemiplegic migraine. Defects, or mutations, in any of these genes can lead to a breakdown in your body's ability to make a certain plasma membrane protein. Without it, nerve cells have trouble maintaining the sodium ($\text{Na}^+$) and potassium ($\text{K}^+$) gradients across cellular membranes, interfering with the transmitting or receiving of nerve impulses. Most people with hemiplegic migraine inherited the genes from a parent with the condition. Symptoms commonly start in childhood or adolescence.
In all cases, serious medical conditions such as stroke need to be ruled out before a diagnosis of hemiplegic migraine can be considered. In Serene’s case, a complete workup was done, starting with the stroke protocol to exclude a stroke. She received imaging of the brain, ultrasound of the heart and the blood vessels in the neck and the brain, along with extensive blood tests, and ultimately evaluated by a cardiologist, as well as migraine specialists and neurosurgeon.

So how could a migraine cause the symptom of speech dysfunction? A migraine begins when hyperactive nerve cells send out impulses to the blood vessels leading to the dilation of these vessels and the release of prostaglandins, serotonin and other inflammatory substances that cause the pulsation to be painful. A spreading of a wave of vasoconstriction following vasodilation and prolonged sustained vasoconstriction of contiguous cortical arterioles create ischemia. Depending on which area is affected, symptoms related to that area develop. Rarely, the vasospasm and reduction in blood flow can be so severe that a stroke can occur.

Different types of language problems can occur as different parts of the brain are affected. If it affects the prefrontal gyrus, which controls movement, then there may be problems with movement of a limb or with the face. When it affects Broca’s area (the base of the posterior frontal lobe), expressive aphasia (also known as non-fluent aphasia or Broca’s aphasia) can occur. Expressive aphasia results in the inability to form speech, although the ability to comprehend or repeat words is maintained. This is exactly what happened with Serene Branson. Wernicke’s aphasia (also called fluent aphasia or receptive aphasia) affects the ability to speak, comprehend and repeat words or phrases. The words and phrases may be clearly articulated but do not have the desired meaning (ex. “Merry Cat” instead of Merry Christmas).

The episode that Serene Branson experienced is one of several conditions known as stroke mimics. With stroke mimics, the symptoms are similar to a stroke but actually are caused by other conditions, most commonly low blood sugar, migraines, seizures, Bell’s palsy, or a brain tumor. Hypoglycemia is probably the most common of the mimics. A fingerstick reading will quickly identify low blood sugar as the cause. A focal seizure can manifest as a brief loss of neurologic function, including a brief episode of aphasia. There are numerous possible causes for the new onset of a seizure. A brain tumor, drug reaction, brain hemorrhage or low blood sugar are all possible causes of a focal seizure. In addition, some patient exhibit temporary hemiparalysis or other focal neurological symptoms after a generalized seizure, known as Todd’s paralysis.
Bell’s palsy, another common stroke mimic, causes facial drooping that is usually unilateral. It is thought to be caused by a viral infection leading to inflammation or infection in the facial nerve (called the seventh cranial nerve). Symptoms include facial droop, drooping of the eyelid, drooling, dryness of the eye or mouth or excessive tearing in one eye. Brain tumors can also cause symptoms that mimic stroke, such as headache, confusion, nausea, weakness and disturbance in the way you walk, or headaches that are worse in the morning, when coughing, exercising or changing position.

Cluster Headache

Cluster headaches are one of the least common types of headache, and their cause is poorly understood. They come in groups (clusters) separated by pain-free periods of months or years. A patient may experience a headache on a daily basis for weeks or months and then be pain-free for years. This type of headache affects men more frequently than women, and often begins in adolescence but can extend into middle age.

- During the period in which the cluster headaches occur, pain typically occurs once or twice daily, although some patients may experience pain more often.
- Each episode of pain lasts from 30 to 90 minutes.
- Attacks tend to occur at about the same time every day and often awaken the patient at night from a sound sleep.
- The pain is typically excruciating and located around or behind one eye.
- Some patients describe the pain as feeling like a hot poker in the eye. The affected eye may become red, inflamed, and watery.
- The nose on the affected side may become congested and runny.

Unlike patients with migraine headaches, patients with cluster headaches tend to be restless. They often pace the floor, bang their heads against a wall, and can be driven to desperate measures including contemplating suicide. The initial treatment for cluster headaches is oxygen, administered at 6 liters per minute via non-rebreather mask for 15 minutes. Sometimes, additional treatment is needed; medications such as steroids, calcium channel blockers, antiseizure and antidepressant medications have been used.
Secondary Headache

The International Headache Society lists eight categories of secondary headache (due to an underlying structural problem in the head or neck). A few examples in each category are noted below.

**Head and neck trauma**
- Injuries to the head may cause bleeding in the spaces between the meninges, the layers of tissue that surround the brain (subdural, epidural, and subarachnoid spaces) or within the brain tissue itself (intracerebral hemorrhage).
- Edema or swelling within the brain, not associated with bleeding, may cause pain and a change in mental function.
- Concussions, where head injury occurs without bleeding. Headache is one of the hallmarks of post-concussion syndrome.
- Whiplash and neck injury also cause head pain.

**Blood vessel problems in the head and neck**
- Stroke or transient ischemic attack (TIA).
- Arteriovenous malformations (AVM) when they leak.
- Cerebral aneurysm and subarachnoid hemorrhage. An aneurysm, or a weakened area in a blood vessel wall, can expand and leak a small amount of blood causing what is called a *sentinel headache*. This may be a warning sign of a future catastrophic bleed into the brain.
- Carotid artery inflammation.
- Temporal arteritis (inflammation of the temporal artery).

**Non-blood vessel problems of the brain**
- Brain tumors, either primary, originating in the brain, or metastatic, from a cancer that began in another organ.
- Seizures.
- Idiopathic intracranial hypertension, historically called *pseudotumor cerebri*, where pressure within the spinal canal increases. The cause is unknown and while it can occur in all ages, it often affects young, obese females. Idiopathic intracranial hypertension can lead to blindness, if left untreated.

**Medications and drugs (including withdrawal from those drugs)**
Oral contraceptives, medications used to treat erectile dysfunction, blood pressure or other cardiac medications can all lead to or cause headaches. Medication overuse headache (MOH), occurring when pain medications are taken too frequently, can be caused by acetaminophen (Tylenol and others), aspirin, ibuprofen (Advil and others), OTC analgesics with caffeine (Excedrin®, etc.), as well as narcotic analgesics and other prescription pain medications. MOH, formerly rebound headache, may improve for a short time after medication is taken and then recur, or rebound.
**Infection**
- Meningitis
- Encephalitis
- HIV/AIDS
- Systemic infections (for example, pneumonia or influenza)
- Brain abscess

**Changes in the body's environment**
- High blood pressure (hypertension)
- Dehydration
- Hypothyroidism
- Kidney dialysis
- Preeclampsia
- Carbon Monoxide Poisoning

**Problems with the eyes, ears, nose, throat, teeth, sinuses, and neck**
- Sinus infection
- Dental pain
- Glaucoma
- Iritis

**History and Physical Exam**

The patient history and physical examination provide the initial direction for determining the cause of secondary headaches. Therefore, it is extremely important that a patient with **new, severe headache** receives a thorough assessment. When assessing a patient with a headache, determine the following:

- When was the onset? Is it new or of recent origin?
  ✓ Headaches with acute or sudden onset, headaches in patients without a history of headaches, or headaches that differ from prior headaches may indicate a life-threatening condition.

- What is the location and quality of the headache?
  ✓ Headaches caused by an expanding intracranial mass often are focal (localized to one area) in nature.

- Were precipitating factors present?
  ✓ Certain activities may precipitate headaches. Patient with a history of headaches may be able to provide a list of triggers.
• Do any factors mitigate or worsen the headache?
  ✓ Headaches caused by increasing intracranial masses often worsen with sneezing, coughing, or other activities that increase intracranial pressure. Migraine and cluster headaches often decrease with exposure to darkness or pressure application to the temporal artery. They may increase with exposure to bright light (photophobia) or loud noises. Photophobia also may be present in headaches caused by meningitis.

• Does the patient have a history of head trauma?
  ✓ Cranial hemorrhages can occur months after seemingly minor trauma.

• Does the patient have associated seizures, altered mental status, confusion, coma, or focal motor abnormalities?
  ✓ Headaches associated with seizures, altered mental status, focal motor findings strongly indicate the presence of increased intracranial pressure or meningitis. Patients with increased intracranial pressure also may have ipsilateral (on the same side) pupil dilation.

• Is the patient pregnant?
  ✓ Consider the diagnosis of preeclampsia in women who present with headache during the second half of pregnancy.

• Does the patient show signs of meningeal irritation?
  ✓ Headaches caused by meningitis are associated with stiff neck, fever, and rash.
  ✓ Involuntary muscle spasm limiting passive neck flexion.
  ✓ Inability to flex neck to place chin on chest.
  ✓ Unreliable in age under 18 months due to underdeveloped neck musculature.

Neck stiffness is the most important sign of meningitis. When the neck is flexed, the inflamed nerve roots and meninges of the cervical region are stretched. This causes protective muscle spasm resulting in neck stiffness. Eliciting neck stiffness while the patient sits up with knees extended achieves this.

(A) When the thigh is flexed at the hip and knee at 90 degree angle and subsequent extension in the knee is painful (leading to resistance). (B) Severe neck stiffness causes a patient's hips and knees to flex when the neck is flexed. This may indicate subarachnoid hemorrhage or meningitis.
Common tests performed in the Emergency Department include the following:

- blood tests;
- computerized tomography (CT scan) of the neck;
- magnetic resonance imaging (MRI) scans of the head; and
- Lumbar puncture (LP) (spinal tap).

Blood tests may be used to assess electrolyte imbalance, and a variety of other potential problems involving organs like the liver, kidney, and thyroid. Toxicology tests may be helpful if the patient is suspected of abusing alcohol, prescription, or other drugs of abuse. Computerized tomography (CT scan) is able to detect bleeding, swelling, and some tumors within the skull and brain. It also can show evidence of a previous stroke. With intravenous contrast injection, angiogram may also be used to look at the arteries of the brain for aneurysms. MRI is able to view the anatomy of the brain and meninges. It is more precise than computerized tomography. Cerebrospinal fluid obtained from lumbar puncture may show signs of infection (such as meningitis due to bacteria, virus, fungus, or tuberculosis) or blood from hemorrhage. These tests, in combination with the history and physical examination can lead to a diagnosis.

The “Worst Headache”

The Circle of Willis is the junction of the four major arteries—two carotid arteries and two vertebral arteries—that supply the brain with nutrition (especially oxygen and glucose). This loop of arteries is located at the base of the brain and sends out smaller branch arteries to all parts of the brain. The junctions where these arteries come together may develop weak spots, which can balloon out and fill with blood, creating the outpouchings of blood vessels known as aneurysms. These sac-like areas may leak or rupture, spilling blood into surrounding brain tissue.

- Cerebral aneurysms are common, but most are asymptomatic and are found incidentally at autopsy.
- Aneurysms can leak or rupture causing symptoms that range from severe headache to stroke-like symptoms, or death.
- Maintain a high index of suspicion since many patients may have an initial small leak of blood causing symptoms hours or days before a catastrophic bleed occurs.
- Diagnosis of a brain aneurysm may require CT scans, lumbar puncture, or angiography.
- Treatment to repair the aneurysm may involve neurosurgery to secure the weak blood vessel wall. Instead of surgery, some patients may be treated by an interventional radiologist or neurologist who may use a coil to prevent bleeding.
In some cases, the aneurysm may cause symptoms by pushing on other areas of the brain. Depending on the size of the aneurysm and the area involved, these symptoms can include:

- Headaches
- Blurred Vision
- Neck pain
- Speech Changes

When a brain aneurysm ruptures, there is bleeding within the brain. Symptoms of a ruptured brain aneurysm come on suddenly and include a **severe, sudden headache** that is different from other headaches an individual has experienced, often described as the "worst headache of my life." Thunderclap headache (TCH) refers to a severe headache of sudden onset. Its explosive and unexpected nature is likened to a "clap of thunder." Although TCH initially referred to pain associated with an unruptured intracranial aneurysm, multiple etiologies are now recognized, most notably subarachnoid hemorrhage and other potentially ominous etiologies.

**Headache and Vertigo**

The presentation of headache and vertigo in the following case creates a lethal combination. PSNet (Patient Safety Network) produced for Agency for Healthcare Research and Quality (AHRQ) hosts a WebM&M (Morbidity and Mortality Rounds on the Web) featuring expert analysis of medical errors reported anonymously by readers. In this case, an understanding of vertigo and the various causes is important to recognizing this potentially life-threatening scenario. While this case highlights Emergency Department management, it brings out features of the history and physical that can be performed by the EMT or paramedic.

A 64-year-old woman, with no prior medical history, complained of sudden onset of **severe vertigo** and vomiting, without headache. Her initial blood pressure in the emergency department (ED) was 170/90 (at about 4:00 PM). Physical examination was limited because the patient's vertigo dramatically worsened when she opened her eyes. On initial neurological exam, the patient could follow commands and there was no focal weakness. Labyrinthitis was initially suspected, and prochlorperazine (Compazine) 10 mg IV was administered. An hour later, however, the patient noted little improvement, and so lorazepam 2 mg IV was given. An hour after that, the patient was administered atropine 0.5 mg IV. Four hours later, she was admitted in the ED. At 11:00 PM, the patient complained of a **headache** and was given acetaminophen 650 mg by mouth. An hour later, the patient sustained a cardiopulmonary arrest and could not be resuscitated.

Autopsy revealed that the patient had died of a **cerebellar hemorrhage**. A subsequent review of the case indicated that the death was potentially avoidable, had life-saving neurosurgery been performed within the first few hours of her ED presentation.

**Commentary**

Vertigo is a sensation of motion, of self or surroundings, and can be **rotational** (ie, a spinning sensation) or **translational** (ie, a sense of floating upward). The causes of vertigo are many; the common denominator is an abnormality in the vestibular system, which comprises the **inner ear labyrinth** and the **central nervous system (CNS)** structures that process signals from the labyrinth. Vertigo can occur spontaneously (e.g., as the result of vestibular neuritis or Meniere’s disease), or can be provoked, as in benign paroxysmal positional vertigo. When severe, vertigo is often accompanied by nausea and vomiting, as it was in this case. In the majority of cases, patients will be discharged home with medication to alleviate the symptoms. Rarely, as in this
case, vertigo represents the presenting symptom of a life-threatening, treatable condition, such as a cerebellar hemorrhage.

What features of this case suggest that the CNS, not the labyrinth, was the location of the abnormality? Some signs and symptoms associated with vertigo can point more specifically to the inner ear or to the brain. For example, hearing loss and tinnitus suggest the inner ear, whereas cranial nerve or cerebellar findings suggest a brain abnormality. This patient did not present with any signs or symptoms that definitively implicated the brain as the location for her vertigo. Several symptoms and signs, though not specifically characteristic or indicative of a central cause, are so highly suggestive of a CNS abnormality when they accompany vertigo. One such symptom is headache, even though it is an inconsistent symptom of central vertigo and can sometimes be seen in peripheral syndromes as well. In a patient with vertigo, an inability to ambulate should raise concern. Vertical nystagmus and horizontal direction-changing nystagmus are definite central signs; unidirectional horizontal nystagmus can be a peripheral or a central sign.

New-onset acute vertigo, even in the absence of CNS signs require careful examination. A peripheral localization is a diagnosis of exclusion obtained only after testing is completed. Since the cerebellum has numerous connections with central vestibular structures, cerebellar lesions can masquerade as peripheral vestibular disorders (such as labyrinthitis). That appears to have been the case here: this patient's presenting symptom complex of vertigo, vomiting, and visual intolerance were produced by a cerebellar hemorrhage (the Figure on the left of a cerebellar infarction shows vascular anatomy on top), due to involvement of the vestibulocerebellum. The vestibulocerebellum regulates balance and eye movements.

MRI of a Right Inferior Cerebellar Infarction

The inset illustrates the vascular supply to the inferior cerebellum, which is perfused by the medial and lateral branches of the posterior inferior cerebellar artery (PICA) and the anterior inferior cerebellar artery (AICA).

When the presenting complaint is vertigo, think central nervous system, since the brain regions that can cause vertigo are limited to the brain stem and cerebellum. The physical exam should evaluate level of consciousness, gaze, type of nystagmus, numbness or weakness, or coordination. Lowering the room lights to reduce vertigo can sometimes make it possible to examine a patient's eye movements.
**Take-Home Points**

- In rare cases, vertigo represents the presenting symptom of a *cerebellar hemorrhage* if:
  - There is an associated headache;
  - The patient is unable to ambulate; or
  - Physical examination findings suggest a central cause.

- A peripheral (i.e., inner ear) localization for vertigo is a *diagnosis of exclusion* when there are no symptoms, signs, laboratory findings, or evidence on imaging for a central process.

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**Headache and Space**

Long exposure to a zero-gravity environment can affect the human body in multiple ways. Headaches can be a common complaint during spaceflight. In the *Space Headaches* experiment, it is hypothesized that space headaches represent a separate entity among the secondary headaches attributed to disorders of homeostasis, with several possible causes. Scientists believe that microgravity, the condition where the force of gravity is so weak that weightlessness results, is known to cause lower oxygen levels in the blood, and that the normal shift of fluids to the upper body in weightlessness causes increased intracranial pressure. The amount of fluid that shifts out of an astronaut’s legs and toward his or her head during long-duration spaceflight is equivalent to two liters. High levels of carbon dioxide on the International Space Station (ISS) may trigger headaches in astronauts. Tests performed in the Columbus module of the ISS include Doppler ultrasound images of the brain’s blood vessels; magnetic resonance imaging; near-infrared spectroscopy, which measures brain activity through blood movement; and pulse phase-lock loop, which measures skull movement associated with pulses in intracranial pressure, all while orbiting in space.

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**Conclusion**

Headache is diagnosed by analyzing the symptoms, reviewing family history, conducting medical tests, and eliminating other possible causes of the headache. When presented with a patient reporting a headache, the paramedic or EMT needs to maintain a high index of suspicion for life-threatening causes. In cases of trauma, family or bystanders can assist in constructing recent events and verifying gaps in the patient’s recall suggesting brain injury related retrograde amnesia. For non-trauma related headache complaints, a good tool for assessment is your OPQRSTI acronym. Perform stroke assessment (Stroke Patient Criteria, Appendix R) and document and report changes in the neuro exam and the Glasgow Coma Score. Always use Body Substance Isolation (BSI) if meningitis is suspected, and if indicated treat for sepsis (Severe Sepsis/Septic Shock, Appendix U).
Non-life-threatening causes of headaches include tension headaches, migraine headaches, cluster headaches, and headaches associated with disorder of the eyes, facial nerve, sinuses, and cranial arteries. Provide comfort and support - dimming the lights in the patient compartment and speaking in a soft tone of voice - to help alleviate the patient’s symptoms. Since the head is one of the most common sites of pain, almost all of us can empathize with this common patient condition.

Co-written by: Lt. Joan Hillgardner, EMTP, Office of Medical Affairs
Dr. Nathan Reisman, Office of Medical Affairs

References

April 2017 Journal CME Quiz – “Headache”

1. Migraines are disabling for many patients, often requiring bed rest. More than ____ % will have some degree of disability:
   a. 20
   b. 40
   c. 60
   d. 90

2. The most common type of headache is:
   a. migraine with aura
   b. cluster headache
   c. tension headache
   d. "hangover" headache

3. A headache that commonly awakens you in the middle of the night with intense pain in or around one eye on one side of your head, causing redness, tearing and nasal stuffiness is:
   a. cluster headache
   b. secondary headache
   c. migraine without aura
   d. dental abscess headache

4. Tension headaches can be caused by all of the following except:
   a. eye strain
   b. grinding of the teeth
   c. emotional stress
   d. hypertension

5. All of the following conditions have been known to mimic the signs of stroke except:
   a. acute myocardial infarction
   b. hypoglycemia
   c. seizure
   d. brain tumor
6. Pain transmission in headache is often carried via one of the cranial nerves. The cranial nerve most often associated with facial pain is the:
   a. Olfactory
   b. Trigeminal
   c. Trochlear
   d. Hypoglossal

7. Thunderclap headache comes on suddenly and is often described as the "worst headache" the patient has ever had. Which potentially serious cause must be considered?
   a. labyrinthitis
   b. aneurysm
   c. vertigo
   d. an aura

8. Your patient is awake, complaining of severe vertigo, nausea, vomiting and visual disturbances. You perform a stroke assessment and it is within normal limits. What headache type does this describe?
   a. Tension headache
   b. New-onset cluster headache
   c. Migraine aura without pain
   d. Occipital compression headache

9. Causes of nystagmus include all of the following except:
   a. migraine
   b. Bell's palsy
   c. seizures
   d. labyrinthitis

10. You respond to a patient with a history of migraine headaches that are usually well managed with daily medications. Today, however, the patient has been vomiting for the past four hours, with photophobia and continued headache. The best treatment choice for this patient would include:
    a. Oxygen, Aspirin
    b. IV Saline Lock, morphine
    c. Oxygen, IV TKO, Imitrex
    d. Oxygen, IV normal saline, ondansetron
Based on the CME article, place your answers to the quiz on this answer sheet. Respondents with a minimum grade of 80% will receive 1 hour of Online/Journal CME.

Please submit this page only once, by one of the following methods:

- FAX to 718-999-0119 or
- MAIL to FDNY OMA, 9 MetroTech Center 4th flr, Brooklyn, NY 11201

Contact the Journal CME Coordinator at 718-999-2790:
- three months before REMAC expiration for a report of your CME hours.
- for all other inquiries joshua.bucklan@fdny.nyc.gov.

Monthly receipts are not issued. You are strongly advised to keep a copy for your records.

Note: if your information is illegible, incorrect or omitted you will not receive CME credit.

Check one:  • EMT  • Paramedic  • ________________  • other

Name

NY State / REMAC # or “n/a” (not applicable)

Work Location

Phone number

Email address

Submit answer sheet by the last day of April 2017

April 2017

CME Quiz

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9. Questions 1-10
for all providers

10.
The Regional Emergency Medical Advisory Committee (REMAC) of New York City is responsible to develop, approve and implement prehospital treatment and transport protocols for use within the five boroughs of the City of New York. The Regional Emergency Medical Advisory Committee (REMAC) of New York City operates under the auspices of Article Thirty of the New York State Public Health Law.

The Regional Emergency Medical Advisory Committee (REMAC) of New York City has revised and updated Appendix P: CPAP. This revision has been approved by the New York State Emergency Medical Advisory Committee for use in the NYC region.

The revised Appendix P is attached, identifying specific changes. New Language is underlined and bold. Deleted Language is struck-out. A revised version without markings is also attached.

This protocol may be implemented immediately. Final date for implementation is August 1st, 2017.

Agencies that require additional time for implementation must submit requests for extension in writing to the NYC REMAC. Requests can be emailed to mdiglio@nycremsco.org

Current and Updated Protocols can be accessed at the Regional EMS Council website: www.nycremsco.org.

Owners/operators of Ambulance and ALS First Response Services providing prehospital medical treatment within the five boroughs of the City of New York are responsible to provide copies of the NYC REMAC Prehospital Treatment Protocols to their personnel, and to ensure that Service Medical Directors and EMS personnel are informed of all changes/updates to the NYC REMAC Prehospital Treatment Protocols.

In order to provide evidence that all EMS personnel have been updated in current protocols, the EMS Agency must provide a list of updated personnel accompanied by a letter of affirmation signed by the service medical director and Chief Executive Officer no later than FOUR (4) weeks after completion of training/in-service.

Josef Schenker, MD, FACEP
Chair, Regional Emergency Medical Advisory Committee of New York City

Marie C. Diglio, EMT-P, CIC
Executive Director Operations, Regional Emergency Medical Services Council of New York City
USE OF THE CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) DEVICE

Scope: Paramedics trained and authorized by the service medical director may utilize Continuous Positive Airway Pressure (CPAP), if available and for any appropriate indication as authorized by the service medical director.

INCLUSION CRITERIA

1. Be at least 18 years of age or older.
2. Be Alert, cooperative, and able to maintain an open, patent airway on their own.
3. Be able to maintain an open and patent airway on their own.
4. Have a blood pressure of at least 100 mm Hg systolic.
5. Have significant respiratory distress, indicated by cyanosis, accessory muscle use or other signs and symptoms.

EXCLUSION CRITERIA CONTRAINDICATIONS

1. Less than 18 years of age.
2. Respiratory failure or need for immediate Endotracheal Intubation, or other methods of airway control.
3. Altered Mental Status or unresponsive patients.
4. Systolic blood pressure less than 100 mmHg. Hemodynamically unstable patients.
5. Airway Obstruction Patients who are unable to control their own airway.
6. Trauma, facial burns with possible airway involvement, impending respiratory or cardiac arrest.
7. Known Active unstable angina or acute myocardial infarction.
8. Uncooperative patient.
9. Known Pneumonia, Suspected pneumothorax, anaphylaxis, pulmonary embolism, or aspiration.
10. Active vomiting, upper GI bleeding or other aspiration risks. Gastric Distention
11. Inability to tolerate the mask due to pain or discomfort.
12. An adequate mask seal is unobtainable.

NOTE: CPAP IS TO BE IMMEDIATELY DISCONTINUED IF ANY OF THE EXCLUSION CRITERIA DEVELOP.

1. An immediate need for advanced airway control arises.
2. The patient becomes hemodynamically unstable.
3. The patient cannot tolerate the mask due to pain or discomfort.
APPENDIX P
USE OF THE CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) DEVICE

Scope: Paramedics may utilize Continuous Positive Airway Pressure (CPAP) for any appropriate indication as authorized by the service medical director.

INCLUSION CRITERIA:
1. 15 years of age or older
2. Be Alert, cooperative, and able to maintain an open, patent airway on their own
3. Respiratory distress

EXCLUSION CRITERIA:
1. Respiratory failure or need for immediate Endotracheal Intubation
2. Systolic blood pressure less than 100 mmHg
3. Airway Obstruction
4. Facial burns with possible airway involvement
5. Trauma
6. Suspected pneumothorax
7. Active vomiting, upper GI bleeding or other aspiration risks
8. Inability to tolerate the mask due to pain or discomfort
9. An adequate mask seal is unobtainable

NOTE: CPAP IS TO BE IMMEDIATELY DISCONTINUED IF ANY OF THE EXCLUSION CRITERIA DEVELOP
**Regional CME** – Sessions are subject to change. Please confirm through the listed contact.

See other opportunities at [www.nycremsco.org](http://www.nycremsco.org) under **News & Announcements**

*Note:* A potential source of **Call Review** is **E.D. Teaching Rounds** (maximum of 18 hours)

See any hospital E.D. Administrator for availability (especially HHC hospitals)

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<td>Maria Jones or Julia Fuzailov 718-883-3070</td>
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# 2016 NYC REMAC Examination Schedule

Updated 6/16/16

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1 REMAC Refresher examination is offered for paramedics who meet CME requirements and whose REMAC certifications are either current or expired less than 30 days. To enroll, go to the REGISTER link under “News & Announcements” at nycremsco.org before the registration deadline above. Candidates may attend an exam no more than 6 months prior to expiration.

2 REMAC Basic examination is for initial certification, or inadequate CME, or certifications expired more than 30 days. Seating is limited. Registrations must be postmarked by the deadline above. Exam fee by $100 money order to NYC REMSCO is required.

All Basic candidates must meet new education requirements. Email Joshua.Bucklan@fdny.nyc.gov for instructions.

3 NYS/DOH exam dates are listed for information purposes only. Scheduling is through your paramedic program or contact NYS DOH for more information.