



**Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury
Webinar Series**

**“Management of Headache Following Concussion/Mild Traumatic Brain Injury: Guidance for
Primary Care Management in Deployed and Non-Deployed Settings”**

April 14, 2016 1-2:30 p.m. (ET)

Operator:

Welcome and thank you for standing by. All participants will be in listen only mode throughout today's conference. Today's call is being recorded. If you have any objections, you may disconnect at this time. I would now like to turn the meeting over to Gary McKinney. Sir, you may begin.

Mr. McKinney:

Thank you. Good day and thank you for joining us today for the DCoE traumatic brain injury webinar, Management of Headache Following Concussion/Mild Traumatic Brain Injury: Guidance for Primary Care Management in Deployed and Non-Deployed Settings. My name is Gary McKinney and I am the chief of the office of clinical practice and clinical recommendations for the Defense and Veterans Brain Injury Center at the Defense Centers of Excellence for Psychological Health and Brain Injury. I will be your moderator for today's webinar.

Today's presentation and resources are available for download from the [inaudible] and will be archived in the online education of [inaudible]. Today's resources that are available for download include management of headache following concussion and mild traumatic brain injury, guidance for primary care management in the deployed and non-deployed settings for clinical recommendation, the companion's clinical tool, and the management of headaches patient education site sheet.

Before we begin, let us review some webinar details. If you experience technical difficulties, please visit DCOE.mil/webinars that's dcoe.mil/webinars to access troubleshooting tips. Please feel free to identify yourself and other attendees via the chat box, but refrain from marketing your organization or product.

All who wish to obtain continuing education or credit, or certificates of attendance, and who meet eligibility requirements must complete the online CE evaluations. After the webinar, please visit, again, dcoe.cds.pesgce.com to complete the online CE evaluations and download to print your CE certificate of attendance. The evaluations will be open through Thursday, April 28, 2016.

Throughout the webinar, you are welcome to submit technical and content related questions via the Q and A part located on the screen. All questions will be anonymous. Please do not submit technical or content related questions via the chat box. I will now move on to today's webinar, Management of Headache Following Concussion/Mild Traumatic Brain Injury: Guidance for Primary Care Management in Deployed and Non-Deployed Settings.

More than 339,000 service members sustained a traumatic brain injury between the years of 2000 and 2015. With approximately 82% of these classified as mild [TBI], also known as concussion. Headache is the most common symptom reported following a concussion. The study of Operation Iraqi Freedom and Enduring Freedom, [inaudible] veterans, 74% reported post-traumatic headaches, or PTH, following within 30 days of sustaining a concussion. The presentation will review the newly released pharmacologic recommendation, or CR, which also guides for the primary care management of PTH and the deployed and non-deployed settings. The speakers will address the characteristics of the four most commonly types of PTH and review non-pharmacologic and pharmacologic treatment recommendations for each type. In addition, they will address when specialty referrals may be indicated. Practical resources, including the CR, the companions clinical tool, and the patient education materials are available for download. At the conclusion of this webinar, participants will be able to articulate risk factors associated with PTH, describe and distinguish among the common types of PTH and employ the CR to assess, diagnose, and treat each type of PTH.

I would like to now introduce our speakers. Dr. Ronald Riechers and Dr. Donald Marion. Dr. Riechers is the medical director of the poly-trauma program and chief of the department of neurology at the Louis Stokes Cleveland Veterans Administration Medical Center. He is an assistant professor of the department of neurology at Case Western Reserve University School of Medicine in Cleveland, Ohio. He is a member of the Department of Defense, Department of Veteran Affairs PTH working group. He's also a member, and a subject matter expert for the Department of Veteran's affairs and the DoD, mild TBI clinical practice guidelines working group and received his MD from Northwestern University Ohio College of Medicine.

Dr. Marion is the senior clinical consultant of the clinical affairs division of [DVBIC]. He was an academic neurosurgeon who has focused on clinical pathophysiology and treatment of TBI for more than 25 years. He previously served as professor in the chair of the department of neurosurgery in the Boston University School of Medicine, a professor and vice chair of the department of neurosurgery at the University of Pittsburgh School of Medicine, and was the director of brain trauma research center at the University of Pittsburgh. He received his MD from the University of California. Welcome Dr. Riechers and Dr. Marion.

Dr. Riechers:

Thank you, Gary, for the kind introduction. Welcome to all. I'm Ron Riechers. I'm here to talk a little bit about the guidance for primary care management post-traumatic headache. It's a complicated topic and one that's often very scary for primary care providers and rehabilitation medicine providers alike. Obviously, the required requisite disclosures, I have no financial relationships. The views expressed are mine and shouldn't reflect that of the VA, the DOD, or

the US government. and any programs presented are for descriptive purposes only and not intended to promote some specific institution.

Let's start with some polling questions to get a sense of our audience. If you could all go ahead and answer the question at hand once Chris gets it rolling. It seems like a very good distribution of rehab, primary care and other specialties. It's good that we have a wide audience. We'll try to get our information out to all and help present what is useful to all those who participate.

Next polling question is specific to post-traumatic headaches, so rate how comfortable you are treating post-traumatic headache. We'll go ahead and end the poll. It looks like we've got good opportunities for education across the board. A third of our participants seem to be somewhat comfortable, but some of you are not comfortable and maybe some of you aren't directly involved in the management of post-traumatic headache. As care providers for patients with TBI, it's an important subject matter to be familiar with and understand how the patients are going to be medically managed for some of their symptomatology.

The final, initial set of polling questions, were do you seek headache diagnosis and treatment information to use in your practice? All right, an interesting set of results from the internet to professional organizations and some consulting with other peers and the use of medical journals. All important resources for provider education.

We'll go ahead and move forward with some information that Gary already introduced to the group, but obviously, traumatic brain injury is a significant problem for the Department of Defense and by happenstance as well, the Department of Veterans Affairs, as our soldiers retire and leave the service. They come to us for ongoing care of these persisting problems. The purpose of this clinical recommendation obviously relates to the frequent occurrence of headache after concussion, as stated before, there were some very specific numbers given, both in OIF/OEF and then in a TBI population across the board. Headache is really the most common symptom and one that can persist for months, to sometimes years, after injury, and often requires a mix of pharmacologic and non-pharmacologic approaches to achieve successful treatment.

Our clinical recommendation really follows the development of most DVBIC clinical recommendations. It included evidence review, review of current clinical practice guideline and a multi-disciplinary expert panel. I was lucky enough to be invited to be on that panel and worked with a number of really leading individuals in the field of neurology, as well as rehab medicine, to move forward with an important clinical recommendation. Obviously, there are service specific requirements that may supersede the protocols recommended below, as well as the professional provider judgement, may supersede what we recommend, but these are meant to be a framework to manage these post-traumatic headache patients.

What is post-traumatic headache? Post-traumatic headache is a term that is in evolution, to some extent. The interactional classification of headache disorders is a large document that classifies all headache types and it is in its third iteration. That third interaction, all three have addressed post-traumatic headache. The definition has evolved over time, but all of these issues have all addressed the fact that headache must occur after some kind of injury to the

head or neck or face. Really, the key is that temporal relationship between the onset of headache and the injury, itself. It can be classified as acute or chronic, depending on how persistent the headaches are. If it's within the first three months following injury, it's considered an acute post-traumatic headache. Greater than three months, it's considered to be a chronic post-traumatic headache.

Dr. Riechers:

There are a number of defined risk factors for the development of post-traumatic headache. They include a prior history of headache disorder, female gender, and the presence of comorbid psychiatric disorders. The last of which is important, also predisposing factor for the development of post-concussion syndrome. Other factors that may be risk factors for the development of post-traumatic headache include patient expectation. Do they believe that headache is going to develop and how long that will persist impacts its occurrence after injury. The presence of sleep or mood disturbances, psycho-social stressors, and then potentially, the overuse of abortive headache medicines can be a key phase in after injury can predispose the development of post-traumatic headache.

Finally, the specific type of headache a patient deals with are the specific phenotype of the post-traumatic headache, it's very important for the optimal treatment of these patients. That's what brings us back to basic medicine. You need a good history in physical and review of systems to characterize the underlying headache type or types that are present. The most common types that we see, post-traumatic headaches, that we see are migrainous, tension-like, cervicogenic, and then neuropathic or neuralgiform headaches after trauma. My experience has been that very often, patients have a mix. There's more than one headache type. The treatment of these patients really relies upon identifying what their headache is most similar to, or what their headaches are similar to, and then selecting medications that are appropriate for those typical headache phenotypes.

Obviously, in addition to managing the headache symptoms, the providers should really the concussion management algorithm and the progressive return to activity, clinical recommendations, certainly in the acute phase and obviously, in the early phases, physical and cognitive rest are key for healing and symptom resolution. Another really important rule of managing these post-traumatic headache patients, and patients with concussion or traumatic brain injury in general, is really the avoidance of medicines such as benzodiazepines, Tramadol and opiates. These have a potential negative impact on recovery. There's high risk of rebound, as well as the other dependence issues, and they have a negative potential impact on PTSD and other comorbid conditions.

The algorithm that's available in the files, this is sort of a overview of the algorithm you can see, and you can look at it in more detail by clicking on the files tab, but it really identifies some very specific states of management of the patient. We'll go these piece by piece along the way. At the beginning of the algorithm, you really need to evaluate did the patient have a concussion or mild traumatic brain injury and is that a possible cause for the headache? Typically, post-traumatic headache is going to start within the first 30 days after head injury. However, in patients who have a history, for example, of migraine headaches, if they have a traumatic brain

injury, that could actually exacerbate a prior headache disorder and increase headache frequency or severity.

Sometimes these patients may not actually come to attention until long after the headache starts. If a patient has a mild traumatic brain injury, they're provided education, they're going to recover. They have mild headaches, they take acetaminophen or naproxen over the counter and that seems to work for a period of time, they may not present to their medical provider until later on in the headache evolution, where they may have developed a medication overuse headache, or the headache stops responding to those previously effective medicines.

Dr. Riechers:

Let's go ahead and do another quick polling question, or knowledge check question, which of the following is a red flag and should prompt an immediate evaluation? Okay. As we will talk about in more detail, really any focal neurologic deficit should be considered a red flag. The simple presence of a headache alone, especially one that would be improving, is not in and of itself a red flag for post-traumatic headaches. But neurologic symptoms, such as slurred speech, diplopia, disorientation or confusion, behavioral change, are all things that could suggest a secondary headache disorder or an underlying neurologic process that is causing the headache that would warrant a more intensive workup.

The next step in the algorithm is to perform a focused history and exam of the post-traumatic headache patient. When we get to the history of these patients, it's important, obviously, to get a good detail on the headache itself and understand, not only the intensity of the pain, location of the pain, but also the type of pain. What type of pain is this? Is it a throbbing or pounding pain that might be more migrainous, or is it a tightness, a pressure in the back of the head and at the temples. It may suggest more of a tension type headache. What's the frequency and how long do these headaches last? Are there other associated physical symptoms? Are there visual changes during the headaches or are there changes that precede the headache, suggesting an aura, like a migrainous aura. Is there sensitivity to things like light, noise, or certain odors? Is there nasal congestion or rhinorrhea? Is there nausea or vomiting? Do they have any other physical symptoms, such as numbness, tingling, weakness, neck stiffness? All these associated symptoms that occur with the headache can help you define the underlying headache type.

Other important aspects of the history to gather include their prior headache diagnoses and what's been happening with the natural history of this headache. Is this something that has been progressively worsening with time? Is there a family history with others with headache disorders? What triggers may exist for these headaches? Does sleep alterations trigger a headache? Does emotional stress trigger a headache? Are there foods or certain substances consumed, such as alcohol or caffeine, that may trigger a headache? Are there certain activities that may trigger a headache, such as straining or coughing, or a headache that's triggered or developed after bending forward? These may be suggestive of secondary headache disorders that require other workup.

In the social history, you really want to look up what substances the individual is using. Definitely, we know there's an association with caffeine and migraine headaches, as well as

tension headaches. Sometimes caffeine withdrawal, in and of itself, can lead to a headache. Are there other supplements they're using, such as vitamins or over the counter medications that may also precipitate headache? Certain workout stimulants or other things that are used for weight loss may trigger headaches. Is there a functional affect of these headaches? Does the headache cause them to miss work, family activities, or social activities?

Dr. Riechers:

From a medication standpoint, have they been treated for headaches in the past? If so, what have they used and what's been effective? When we talk about medications, it's important to recognize that medications may be of several different types. They can be abortive medicines, those medicines the patients take at the time of the headache. Or preventative and prophylactic medicines, those they've been on a daily basis to ward off the headaches. What are they taking now, medication wise? There are certain comorbidities, which are very important to inquire about. Insomnia is very important, as poor sleep can be a headache trigger, in and of itself. Depression and anxiety, as those conditions can trigger headache or impact its management. Then obstructive sleep apnea, a disorder which affects a number of different bodily functions that can certainly cause AM headaches, and if left untreated, can lead to hypertension and other cardiovascular problems.

There are a number of questionnaires available that can be used in the evaluation of post-traumatic headache. These are all options for use by the primary care provider in the time allowing. What about the examination? Obviously, when we talk about headaches, the concern that exists is there something intracranially going on that is triggering this headache? One thing we want to do is rule out any intracranial process by a good, thorough neurologic exam. There are some basic things that can be done at the primary care level, which can go a long way in terms of ruling out intracranial pathology. For example, an ophthalmoscopic examination looking for [inaudible]. You also want to do a good cranial nerve examination, and then basic motor, sensory, and coordination testing. On top of that, you want to look at the structures of the head and neck. Are there abnormalities in the cervical spine range of motion? Are there trigger points in the head or neck? Are there problems with the nose or ears, or any sinus related issues, which could be the trigger for these headaches? A basic head, neck and screening neurologic exam are important for the focused headache examination.

What are those red flags? They're red flags that are specific to concussion, and obviously, these are in the concussion clinical management protocol, as well, but one through 12 are important things to look for in the acute phases that would indicate this patient needs an emergent referral. Those red flags that are specific to headaches are listed in table 4.0. they're broken down in to those things that suggest this patient needs an emergent evaluation. I.E., they need to go to the emergency room, have imaging done immediately, versus those signs or symptoms that would prompt a specialty referral.

Those things that require emergency department assessment would include a thunderclap headache. What that means is that's a patient who has the first and worst headache. A headache that develops very rapidly over a matter of seconds to minutes and reaches maximal intensity with significant functional impairment. A thunderclap headache can be suggestive or

concerning for subarachnoid hemorrhage or other intracranial pathology. If they develop a sudden neurologic deficit, obviously again, concern for hemorrhage or stroke, as a potential cause. Any evidence of persistent bleeding or fluid drainage, which might suggest DSF leak, any evidence of cranial fractures, which is a step off when you palpate the skull, and any evidence of papilledema on exam. Those are all things that you might detect in primary care that might require emergent referral.

Dr. Riechers:

How about those things that should say, okay, this patient might need to see a specialist? Obviously, the presence of any systemic symptoms. Fever, chills, night sweat, significant weight loss. Any associated neurologic symptoms, weakness, numbness, tingling, loss of coordination or balance. If the headaches begin after the age of 50, there's a change in the pattern of headaches. So a patient has stable headaches, then all of the sudden, they're significantly more intense, in terms of severity or frequency. If the headache is precipitated by valsalva, that can be a sign of elevated intracranial pressure. If a patient gets a headache from either bearing down from a bowel movement or coughing, that's very concerning. Most headaches will worsen during those activities, but if those activities trigger a headache, that's what should be very worrisome and require a specialty evaluation. Again, if a headache is triggered or precipitated by leaning forward, that can be suggestive of something called a colloid cyst of the third ventricle. Again, requiring specialty evaluation.

Contrast that with cluster headaches, where the pain is much shorter durations, a stabbing type of pain. That's what I call the kidney stone type headache. Those patients pace, move, can't sit still. Cluster type headaches, we rarely see in general neurology practice, and even less common after traumatic brain injury.

The second most common type of headache we see after trauma to the head is going to be the tension type headache. My experience is most patients have a mix of migraine and tension. The tension type headaches tend to be a milder pain. They often come on at the end of the day. The patients will describe it starting posteriorly and radiating anterior, having some pressure or tightening sensation, often at the temples. The pain is often much milder, but it may increase to a level they do have some mild phono or photo phobia, does not typically get exacerbated by physical activity, though.

Cervicogenic headache is another important type of headache disorder, which is being increasingly recognized and is important to recognize because the treatment may differ. The cervicogenic headache, these patients don't really have a headache, or the pain frequency is rather variable, but the pain site is usually in the upper cervical spine and radiates into the occipital region. Often there's musculo skeletal character to it. A burning, tightening pain. It's often exacerbated by head movement. These patients don't have the associated symptoms of nausea or vomiting phono, photophobia.

Neuropathic pain related headaches are much different than the first three. They are very short lived. They're stabbing like headache pains that are often linked to an area of prior injury to the head or neck. The pain character itself may be tingling, sharp, burning, radiating sense. The

pain itself is severe, but very short lived. These headaches, again, are short lived but often happen frequently within a single day. These headaches are not associated, typically, with nausea or vomiting or photo phono phobia.

Dr. Riechers:

The last set of headaches on this table, which we'll talk a little bit more about at the end of the lecture, is that of medication overuse. Medication overuse is an important phenomenon in the post-traumatic headache population, simply because patients of post-traumatic head injury often have frequent headaches and they often medicate for all of their headaches. That predisposes them to a phenomenon where the headache happens and reoccurs over 50% of the days per month and the patients end up taking medications greater than 50% of the days of the month. They build into this cycle of headache, take medication, usually over the counter, and headache goes away and then it comes back within a couple hours and they repeat this cycle over and over again until they get to the point where those previously acting medicines, short acting medicines do not work and they're taking medicine all day and still having a headache all day.

As I talked about before, migraines really are the most common type of post-traumatic headache. Migraines can be classified as with aura or without aura. Treatment for these headache types is basically the same, unless these patients have hemiplegic migraine, which is certainly a subject beyond the scope of this current lecture. We talked a bit about the specific criteria, but there are several requirements for the ICD 9 and migraine without aura. You need to have this duration of headache lasting 4 to 72 hours. Two of the following criteria, unilateral location, pulsating quality, moderate pain intensity, or aggravation by or avoidance of physical routine, physical activity. Then have to have at least one of the following, nausea, vomiting, phono or photophobia.

The treatment of migraine headaches, most often because of their intensity, is pharmacologic at the outset. These patients can use a number of different abortive agents. If the migraines are mild or milder, in terms of their intensity, patients may respond to acetaminophen, Excedrin, other combination therapies, or non-steroidal agents, such as ibuprofen and naproxen. My experience is that patients who respond to these, typically over the counter agents, often don't present for medical care because they've found something that treats their problem. Often, by the time a patient reaches a provider, no matter what specialty, they're at the point that they've failed readily available over the counter medications. These do work for some patients, and if they do, they're good treatments, as long as they're used in a restricted fashion.

More severe migraines often require more intense management. That includes Triptan medications, the Triptan medications are designer drugs that were developed specifically to treat migraines. They are agonist of the 5-HT_{1D} receptor, which is involved in the cycle of events that occurs within the brain stem and cortex to generate a migraine. Triptans do not work for other kinds of pain. Unlike acetaminophen or non-steroidals or Fioricet, those medicines may work for other types of pain, like low back pain or neck pains. Triptans are only going to work for migraine headaches. They work very well when you identify the headache type appropriately. They do have some risks, in that they can cause coronary or cerebral vasospasm. In patients with known coronary artery disease, these agents should be avoided. Similarly,

Dihydroergotamine is an older migraine specific medicine. The Ergots agents have an effect on blood vessels and were thought to treat migraines through that mechanism. They, similar to the Triptans, can't be used in people with history of coronary artery disease or history of stroke. All of the above may have some risk of nausea. The Dihydroergotamine has perhaps higher risk of nausea and diarrhea than the Triptans.

Dr. Riechers:

Other agents that are out there for the abortive agent of migraine include Fioricet, [inaudible]. There's a significant dependence risk with those agents because they contain a barbiturate. Midrin is back available on the market and may be a consideration as well. That's another combination drug that is used for migraine. As stated before, whenever we start patients on abortive medicines, we really need to track the frequency of its use. If I start a patient on an abortive agent, my guidance is you should be using this no more than two to three days per week. If a patient needs an abortive medicine more than two to three days per week, they're at high risk for medication overuse headache. That's when you start to evaluate the utility of a preventative treatment, something they take on a daily basis to attempt to decrease the frequency of their headaches.

The agents that are available from a preventative standpoint include tricyclic antidepressants, anti-epileptics, and beta blockers as the first line. Some clinical caveats with each of these, the tricyclic antidepressants are useful for people with sleep problems but have the potential for ... Have significant suicide risk, have overdose, they potentially could be fatal if a patient overdoses on them. In patients with a known high risk of suicidality, I tend to avoid these agents or use them with close followup with psychiatry being on board. They also are beneficial with neuropathic pain, so patients with low back pain, radicular pain, these might provide double bang for your buck.

Anti-epileptic agents are also very good migraine treatments. I've had a lot of success with Topiramate, Topamax. Topiramate, some avoid because of a concern over cognitive side effects, however, my experience has been that in lower doses used for migraine prevention, the cognitive side effects are less of an issue than the high doses used for seizure management. Valproic acid is a little bit older anti-epileptic that's been used for migraine prophylaxis. Again, both of these agents do have some teratogenic effects. Valproic probably being the more teratogenic of the two. In females of child bearing age, you must be careful in using these agents. Beta blockers also work particularly well, however, they can impact exercise tolerance. In our young veteran soldier population, that may be problematic if they're max PTers and they cannot run as fast as they used to or as long. You have to take into a number of factors when considering the appropriate preventative treatment.

Second line agents include the serotonin norepinephrine re-uptake re-inhibitors, like Venlafaxine and Botulinum toxin A, Botox, obviously that's typically going to be a specialty care delivered therapy, so if you're at that level, referral is recommended.

Tension type headaches. A couple other clinical pearls about identifying tension type headaches. There are some physical exam findings you may detect, including scalp palpation

tenderness and that tenderness can also be listed as by small movements, rotating movements of the head, firm pressure over the head and neck muscles at the base of the skull. The tenderness may be there during and in between headaches. It's something to look for on a basic exam. With tension type headaches, again, here's the basic ICD 9 criteria, again, episodic, bilateral pressing, tightening pain. Mild to moderate intensity. Lasts minutes to hours, sometimes it lasts several days but the intensity is they key.

Dr. Riechers:

As I said before, with migraine, we really look at pharmacologic interventions at the forefront. With tension type headaches, non-pharmacologic treatments come to the forefront. Very often, patients actually won't medicate for these headaches because they're relatively mild but they may alter their daytime activities. They may go to bed earlier, they may engage in social activity a bit less because of the mild headaches. There are some things they can do with their lifestyle that may be beneficial, including making sure that they're doing appropriate sleep hygiene interventions, some light exercise, hydration, minimizing caffeine intake. Then there are some active things that we can do that are non-pharmacologic that may benefit these patients. Physical therapy interventions for appropriate posture, treating any trigger points or any areas of muscle tightness in the cervical spine, working with them on stress management and relaxations or behavioral medicines. Acupuncture may be beneficial and biofeedback may all be beneficial non-pharmacologic interventions for tension type headaches.

This is where, in my population, I really find it important to tease out which headaches are which. If I'm going to give a patient a medicine for headaches, I'm going to give them a Triptan, I make it very clear that they understand this migraine like headache, you use the Triptan, but if you have the milder headache, that's time to try your relaxation techniques, try this postural holding this posture, whatever may be educated in physical therapy.

From a pharmacologic standpoint, there are pharmacologic agents that are indicated and used for tension type headaches. The abortives include over the counter preparations, acetaminophen and non-steroidal. Second line would be the Excedrin or acetaminophen caffeine containing compounds. Preventative treatment, much less frequently needed but does include some of the similar medicines we talked about with migraine, but also SSRIs as well as some of the Tetracycline antidepressants, so Mirtazipine, which may benefit sleep as well.

We're going to go to a knowledge check. Which of the following interventions is not considered a reasonable first line intervention for an acute, tension like headache? Okay, very good. Everybody seems to recognize and recall from our early parts of this talk that opiates and Tramadol are not indicated, and are certainly not indicated as first line therapies for the treatment of a tension type headache. Typically, the headache intensity in a tension type headache would not lead one to use an agent such as Tramadol, but nonetheless, these should be avoided after TBI.

Next we'll move on to cervicogenic headaches. Cervicogenic headaches are headaches that are caused by a disorder of the cervical spine or soft tissue of the neck. They're often associated with neck pain and it has, again, that temporal relation to some injury of the neck,

head, and neck. The key here being, range of motion is reduced and that the headache is made worse by head and neck movement. Several physical exam findings that one could look for, detailed above, reduced range of motion, provocation of the headache by pressure on neck muscles, whereas tension type headaches, the tenderness is at the junction between [inaudible] and the cervical spine. In this case, it's actually digital pressure on lower cervical muscles triggers a headache pain.

Dr. Riechers:

From a treatment perspective, certainly you can use pharmacologic intervention, such as non-steroidals, also may consider muscle relaxants, Tizanidine has been used in my practice with some benefit. More often than not, I'm using, in my practice, using non-pharmacologic interventions with physical therapy. Interventions such as trigger point injections, or therapy to dry needling, as well as acupuncture may be considered. There are a number of preventative, which again, may be trialed, but I often hold off on those preventatives until I've tried non-pharmacologic interventions.

We talked a bit about the headaches related to neuropathic pain, the diagnosis and assessment of these. These patients often have a complex chronic pain that has occurred as a result of some soft tissue injury to the scalp or face. Very often, if there's a branch of the trigeminal nerve that has been injured, this can cause this kind of neuropathic pain. Often the pain is somewhat out of proportion to the severity of the injury. As we've talked about before, the nature of the pain is often burning, tingling, and very often, there's decreased sensation in the affected area. The physical exam may reveal evidence of that nerve injury and you may be able to illicit the typical pain by palpation of the region of injury. Certainly, movement may exacerbate or trigger these kinds of pain. These are ICB 9 specific criteria, very similar to what we talked about. You can have that local tingling and numbness, you can have hyperaesthesia, hyperalgesia or allodynia, where you have pain that's triggered by normally non-noxious stimulus or an exaggerated pain in response, hyperphasia. These types of headache pains are often long lasting, last much longer after the initial injury.

From a treatment standpoint, there are non-pharmacologic treatments, which can be trials similar to many chronic pain conditions. From an acute pharmacologic standpoint, acetaminophen or non-steroidals can be trialed. Often because of the frequency of these bouts or attacks of pain, preventative agents are required. In this case, because we are talking about a neuropathic type of pain, we use medicines that are usually used for neuropathic pain, so anti-epileptics, and in this case, this is one where Gabapentin might be a good preventative treatment, as well as tricyclic antidepressants, Amitriptyline, Nortriptylines, with the similar caveats that we discussed before.

Lastly, in terms of headache types, which are addressed in the clinical recommendation, is medication overuse headache. As I mentioned before, it's a headache that is present for 15 or more days per month and it happens when medications that we're using to treat the headaches are used more frequently than recommended and for longer than the recommended time. I.E. patients using Triptan medications five days a week for three months.

Dr. Riechers:

In this case, this is where one of the real challenges in medicine comes into play, and that is, how do we treat the medication overuse? Treatment of medication overuse headache is actually stopping the offending medication, which can be very challenging when a patient has been used to receiving medication X, whether it's I've been taking Excedrin and Excedrin works, if I don't take the Excedrin, my headache is even worse than it is now. Or if you prescribed the medication for the patient, you gave them some Triptan and they began to use it inappropriately, and then you're suggesting taking away the thing that seemed to have been most effective for them. It can really create some mild conflict with your patient. You have to really educate them about what's happening. In the long run, provide them significant supportive care and re-education and close followup.

Some have suggested substituting other medications to manage the withdrawal of the offending agent. That could include using a burst of steroids, such as Prednisone, during a period of time where an individual is stopping, for example, Sumatriptan. It could mean substituting Benadryl or Promethazine during that period of time to promote sleep or promote nausea management. The use of these medications is somewhat controversial, especially substituting a one medicine that can cause rebound headache for another medicine that could potentially cause rebound headache. The key is really prevention of the medication overuse, which is tight education of your patients and warning from the get go: this is how often you should be using this, if you're using it more than X, that really suggests to me that we need to do something different. Medication overuse is something that is almost iatrogenic in a sense, and is potentially preventable and we need to work hard to prevent our patients from slipping into that medication overuse headache.

Now I'm going to turn it over to Dr. Marion, who's going to talk a bit about some case studies.

Dr. Marion:

Thank you, Dr. Riechers, that was an excellent overview of the headache CR and a healthy dose of how you actually apply these recommendations to your practice. Unlike Dr. Riechers, I'm a neurosurgeon, so the majority of my practice was more severe head injuries. I used to be grateful if my patients were alert enough to complain of a headache in my practice. What I will do is discuss some of the cases, the actual case studies, that we received from [inaudible] during Operation Enduring Freedom. I [inaudible] I have nothing to declare, except that I'm grateful to be presenting to you all today. Next slide.

Again, I'm hoping that this will be a little more fun aspect of this, in terms of being interactive and a chance for you to see what the actual patients look like, what the real world situation was, and how this was handled. I'm going to present to you three cases that we heard about through tbi.consult, which is a service that is detailed and [inaudible] provided for service providers that were deployed. They could email this service and reach one of us, myself or one of my colleagues, who were specialists in various fields, and get direct information about how they might manage their patients.

The first individual is Corporal Smith. By the way, these names have been changed for offset, as you might expect. Corporal Smith isn't really Corporal Smith. His history is he suffered a concussion approximately two weeks prior to our consult, due to a blow to his head. He had loss of consciousness, nausea, headache and amnesia for the event. He certainly met the criteria for concussion. He had a CT that was normal. It was obtained fairly soon after the injury and he had otherwise done well. He had presented, however, through his PCP with headache in the mornings requiring him to lay in bed until it resolved. They did not occur during the rest of the day, however. They were just in the morning. He was not taking any medication for the headache when he presented to the provider. He is a caffeine drinker but had not changed his caffeine intake and did not drink coffee at night or take energy drinks, which are primarily caffeine.

In terms of his symptoms, he had dizziness every three days or so, lasting approximately five seconds per episode. Not a big deal. Subtle decrease in mental agility and just not feeling as mentally sharp as he normally felt. He had no photophobia. He had a normal neurological examination and otherwise he was back to his normal self, including his normal fitness regimen of running and weightlifting.

The treatment that was prescribed was Tylenol, a thousand milligrams by mouth every six hours and then he was asked to come back for reevaluation in 48 hours. We can put these out for these audience to do. All right, I'll just keep going. Dr. Riechers, I'm going to pose these questions to you and the first one is, if his headaches subsists, what should be the next step?

Dr. Riechers:

Certainly, the concern here is that we have a patient with basically daily AM headaches. Starting any kind of daily abortive therapies, we do run the risk in the long term of medication overuse. If the acetaminophen is ineffective, the next step, in my opinion, would be to consider a non-steroidal, a longer acting non-steroidal, which may have ... Now you can watch me while I talk, which is more exciting, I guess ... A longer acting non-steroidal may have a lower risk of the development of medication overuse. My use of non-steroidals in the acute phase after injury is generally several weeks if they're using it on a daily basis, then we transition. As you've mentioned in question two, an agent potentially, such as Nortriptyline or Amitriptyline.

The other thing that I would be very concerned about, or want to get a good detailed history on, is since he has AM headaches, morning headaches, I would really want to get a good history of whether this patient might have obstructive sleep apnea. Are there frequent nocturnal awakenings? Is he known to snore? Do his barracks mates complain of him waking them up? Does he have episodes of choking during the night, where he awakens and he can't catch his breath? Certainly, AM headaches can be a warning sign for obstructive sleep apnea. In my population, there's a seemingly high comorbidity of obstructive sleep apnea. I don't know if that's related to the injuries, to PTSD, to medications, or simply the fact that many of our soldiers are very physically active, lift a lot of weights, and have very big necks.

Dr. Marion:

You're suggesting, Dr. Riechers, that perhaps, if it sounded like he did have problem with snoring and talking to his wife, not that wives ever know about snoring, but if he did, in fact, have a history of snoring, that treatment of that sleep apnea would possibly cure his headache.

Dr. Riechers:

Absolutely, if that is the precipitant. I understand in a deployed environment, that's not exactly an easy thing to evaluate, but it's something to keep in the back of your mind when you have a patient with AM headaches, is to consider obstructive sleep apnea and screen appropriately for excessive daytime somnolence, as well as the symptoms we talked about. Otherwise, those being negative, then I think the trial of a short term use of a Nortriptyline or Amitriptyline. My starting dose is typically 10 milligrams. It's very low. Many people might seem to think that it's too low, but I'd rather ... I've seen too many people who get started too high a dose don't tolerate it and won't try it again, simply because the dose that they started at was too high and they were sedated. The lower dose allows them to adapt to it faster and potentially tolerate it better over the long run.

Obviously, evaluation of caffeine, sleep hygiene, what he's doing during the day. Are there activities that might precipitate these headaches, such as sitting in a certain posture repeatedly, staring at an iPad or some electronic device. Those things are important to evaluate as well.

Dr. Marion:

Dr. Riechers, is his headache a migraine, a tension type, cervicogenic, neuropathic? What kind of headache does he have?

Dr. Riechers:

I would suggest that this is more of a tension type headache, given the lack of significant functional impairment. Obviously, you have to lay down for a period of time, but there aren't those associated signs that concern me for a typical migraine. Migraine's going to be usually a half a day, all day kind of event for most patients. They are going to be more physically prostrated than what was described above.

Dr. Marion:

Okay. Next slide. One point I wanted to make here in this talk is that it's important to make sure you get a complete history. I think that we might have been a little bit more comfortable diagnosing the type of headache as well, if we had a little bit more history on things like the site of the headache and specific pain characteristics. I would suggest that a good quality evaluation of your patient with a headache would include a discussion of all of the items that are on the left hand side of this table, whether there's [inaudible] duration, specifically site, pain characteristics, pain severity, what it's aggravated by, nausea, photophobia. If you have all of those characteristics, probably, then I think it's easier to feel comfortable about your differential diagnosis of the type of headache you're dealing with.

Just some quick followup. Corporal Smith, 24 hours later, according to the progress, returned to activity. Clinical recommendations in what stage is the patient currently in? The soldier is currently at stage 5. He's having symptoms but they're not brought on by [inaudible] only occurring in mornings. A followup 24 hours later, again, continued that he's a chronic caffeine user, should he stop all caffeine? I'll turn this over again to Dr. Riechers. What's your recommendation?

Dr. Riechers:

The role of caffeine in headaches is a challenging one and potentially has some controversy. The general recommendation is for normal individuals, or those with headaches, is limit your caffeine intake to one serving. That typically is a 12 oz. soda, 6 oz. cup of coffee, or less, per day. For those of us that have treated soldiers and veterans, we know that many of them function on very limited sleep because of OPTEMPO and lifestyle, so they're often using far in excess of the recommended daily allowance of caffeine. If an individual clearly has headaches that are triggered by, for example, they drink a Monster energy drink and a headache develops later in the day, I will have them eliminate those. If they fail, for example, the prophylactic therapies, then the next step would be to stop all caffeine with the caveat that that could potentially, for the short period of time, worsen their headaches from caffeine withdrawal.

Dr. Marion:

I'm glad you brought up energy drinks. I think it's important for people to understand that energy drinks are primarily concentrated caffeine. We're not just talking about a cup of coffee here, we're talking about Monster and Five Hour Energy and those type of things. That's important to keep in mind as well.

The final [inaudible] followup for 24 hours was patient's returning to clinic the next day. Tylenol is not working sufficiently and this particular provider, in theater, was planning to start Amitriptyline 20 milligrams by mouth at night, but he only had 10 milligram tablets. The question was, should he continue Tylenol or a non-steroidal anti-inflammatory, even after starting the tricyclics? Your thoughts, Dr. Riechers?

Dr. Riechers:

I would not continue Tylenol in perpetuity. That's something that ... I find Tylenol to be a very strong driver of medication overuse headaches. I stay away from Tylenol, almost without fail, in these patients, unless they have kidney disease or an ulcer, or another reason that we couldn't use non-steroidals. I wouldn't use them, the non-steroidal agents, as taking every day on a schedule basis. I would, in fact, set perimeters for use of pain medications in this patient. Setting a pain score threshold or a functional score threshold. If your pain reaches this level, then take non-steroidal, but try to wean them off of use of those pain medicines while you're supplementing the Amitriptyline. I would, as I stated before, I would start the patient at 10 and see if 10 is effective in improving sleep and the AM headaches, rather than jumping right to 20. It solves both of the problems. They only have 10 milligram tablets.

Dr. Marion:

Great. All right. Lieutenant Jones, case number two. This individual suffered a concussion approximately two weeks prior to visiting the provider. He had a blow to the head. He had loss of consciousness, nausea, headache and amnesia. He met DOD criteria for concussion. Head CT was obtained acutely and was normal. It's otherwise done well. Now he presents these extensive headaches in the morning, requiring him to stay in bed until they resolve. They do not occur during the rest of the day. He is not taking any other medications for his headache as he sees his provider. He is a caffeine drinker, or coffee, well, caffeine drinker, and had not changed his caffeine intake and does not take caffeine at night.

His symptoms are that he complains of dizziness every three days or so, lasts five seconds or so per episode. The subtle decrease in mental agility and just not feeling as mentally sharp as usual. He does not photophobia. He has a normal neurological exam and otherwise is back to his normal self, including his normal fitness regimen of running and weightlifting. He was prescribed Tylenol, a thousand milligrams by mouth every day. Recommendation was to reevaluate in 48 hours.

Next steps. Again, Dr. Riechers, I'll turn this over to you. What should be done next here?

Dr. Riechers:

Again, I think with a normal exam, we really are thinking against this being any sort of secondary headache disorder. I often will transition these patients to a short course of long acting non-steroidals, usually Naproxen. If there are clear sleep problems, or that's not effective after a period of one to two weeks of schedule dosing, then I would transition them to a prophylactic therapy again in the short term. Very often, patients who are in the post concussion phase of symptoms, often have insomnia in addition to their headaches. Nortriptyline or Amitriptyline are good choices because they promote sleep and potentially promote better sleep for a period of time. That does not mean I'm going to keep them on those agents long term. Generally in the acute post concussive phase, I'll try them for a month. If symptoms are improving in a month, we'll start to wean down medications and see how the patient responds.

Lifestyle wise, it's kind of the same things we talked about with the last case. Looking at caffeine intake, activity levels, what they're doing that might precipitate, a postural or other that might precipitate headaches, dietary intake, et cetera.

Dr. Marion:

Great. We'll move right along to the final patient because we're running a little bit short on time. The last patient, Private First Class Thomas. He's a 23 year old active duty soldier. He sustained a blow to the head [inaudible] he was hit three times with the handle of a 50 cal in the front of his head. Seen in the field by a medic, given Tylenol, but not administered [inaudible]. He did not have a [inaudible] prescribed. He presumably went back to duty.

Reports now of constant headaches, despite continuing with his regular duties. He went to the emergency department for listing headaches, had a CT that was normal, was prescribed Toradol, Benadryl, Solu-Medrol and Reglan. Improved with these medications. He was instructed on [inaudible] but no official profile. He was reported to have had a normal

neurological exam. Then 8 days after his injury, he came back. Now his headaches were still back, 4 to 6 per day. Described his problems being in the troop medical clinic. His clinical spine films were reportedly normal. He was started on [inaudible] twice a day, 500 milligrams each. Placed on light duty profile with no participation in physical training. In the regular sleep cycle with odd hours and has been sleeping in open bay, so not the greatest sleep hygiene.

Again, he was reported of having normal neurological exam. Now 13 days after his injury, he's still having an almost constant headache, described as throbbing. Happens when he walks around, will go when there's less and then start again with activity. He's still been helping out with operations and packed up all his stuff and changed duty locations. He's physically pretty active. Normal neurologic exam, normal stats [inaudible]. Amitriptyline 25 milligrams at night, [inaudible] 250 milligrams, and Tylenol is needed for his pain. He was profiled with light duty only and scheduled for rest from 21:00 to 06:00 hours. 15 days post injury, now down to two headaches per day, described as throbbing, lasting about one hour. He still gets symptomatic and when he tried to Skype with his wife, he feels a little bit better. Despite that, still having some difficulties sleeping. Still in the open bay. The rest of the company returned [inaudible] middle of the night both nights, so it was disruptive, obviously. Reports being very, very bored having twice scheduled spare time and spoke with First Sergeant to find [inaudible].

These are medications he was prescribed, Ambien for sleep, continued Amitriptyline, [inaudible], Tylenol, and on profile for light duty. No exercise, normal neuro exam. Next steps, Dr. Riechers, I'll turn this over to you.

Dr. Riechers:

Again, I understand the regular use of Tylenol because it's readily available, but certainly, this is a case, we're 15 days out from injury. This individual is increasingly ... Demonstrating a pattern of some recovery. Went from a chronic, persistent headache throughout the day to one to two headaches lasting shorter periods of time. I would really eliminate the Tylenol. I agree with the scheduled sleep and rest periods and trying to normalize some activity and sort of a progressive return to normal activities. I would also, given the possible postural positioning of some of these headaches, when he's laying in bed trying to Skype with his wife, things like that, I would actually have him evaluated by the physical therapist for any trigger points or any potentially manual therapies to the neck and shoulders that may be contributing to the headaches. Continue the Amitriptyline and I would probably, myself actually, instead of using Ambien and Amitriptyline, maximizing the use of the Amitriptyline to get sleep most effective, rather than the combination of the Ambien and the Amitriptyline.

Dr. Marion:

Are you thinking tension headaches here as well, sir?

Dr. Riechers:

Again, this is the common mix of these do, especially the one to two hour headaches, sound more tension like. It's hard to say without more details. Earlier on, the headaches may have

been whether they're more likely to have been migrainous in nature and they've devolved at the present time.

Dr. Marion:

I want to summarize briefly and then get on to the questions from our audience. Headache is the most common symptom after a concussion. Most common post concussive symptom. The four most common types of post-traumatic headache are migraine, tension type, cervicogenic, and headache related to neuropathic pain. Post-traumatic headaches should be managed corresponding to the headache type it most closely resembles. Examples of effective non-pharmacologic treatment include sleep hygiene, which Dr. Riechers has described several times now for these three patients. I have to say what a nice kind of treatment to solve several problems for these individuals if you correctly diagnose that and are able to treat this sleep apnea and get rid of their tiredness during the day at the same time, improving their overall health and getting rid of their headache. Physical therapy and relaxation are other forms of non-pharmacologic management.

Examples of effective symptomatic pharmacologic treatment include non-narcotic pain medication and Triptans. There are being patient apps developed, in large part by, T2, Telehealth and Technology Center at DCoE. They're available for free on Apple and Android devices. They can help you keep a diary, keep track of your headaches, but also provide useful tips and management of your headaches. With that, I think we should turn to our questions. Mr. McKinney?

Mr. McKinney:

Thank you Dr. Marion, Dr. Riechers for your presentation. If you have any questions, please be sure to post them in the Q&A area of the podcast located on the screen. At this time we're going to move forward and it's now time to answer some questions from the audience. If you haven't already done so, you may post your questions, again, at the Q&A area. Dr. Riechers and Dr. Marion, our first question is during your brief, one of our members mentioned that some of these flags within the clinical recommendations seem to look like a stroke. Do you have any response to that? It's more of a comment than a question, I guess.

Dr. Marion:

As Dr. Riechers pointed out, certainly a lot of those red flags added up, that's why they are red flags. They raise the concern that the patient might be having a stroke or a ruptured aneurysm or subarachnoid hemorrhage. That's really the classic sign for a subarachnoid hemorrhage, it that thunderclap headache, for example, that Dr. Riechers mentioned. That's correct. That's why they're red flags. They're a concern for something very severe and potentially life threatening.

Mr. McKinney:

Okay. Thank you. Dr. Riechers?

Dr. Riechers:

I would echo that. Really, they are just focal neurologic deficits. Obviously, stroke is one pathophysiology that can cause focal neurologic deficits. The focal hemorrhage, subdural hemorrhage, subarachnoid, they're really just signs that there's something within the brain itself, which may be a secondary cause of the headache. If those are present and a headache, that means that person really needs imaging of some sort to define is there a lesion within the brain, whether that lesion is stroke, tumor, any of the above. They're really just signs of focal damage, which we need to further evaluate.

Mr. McKinney:

Thank you. Our next question, I think we've mentioned it throughout, but since it was asked and brought up, I'm just going to reference it one more time. Why not more manual therapy? I mean, no drugs, as far as the therapy goes for treatment when it comes to PTH.

Dr. Riechers:

I can take this. Our headache team, and we do treat our post-traumatic headache patients as a team, features prominently a behavioral medicine psychologist and a physical therapist. We really look at, when I explain this to patients, I provide them three options. The pharmacologic abortive, pharmacologic preventative, and non-pharmacologic therapies. I make recommendations as to what I think they might benefit from. For example, migraine headaches. While you can probably do auricular acupuncture for migraine headaches or dry needling, it's not necessarily going to be effective for most patients as a Triptan medication. However, there are other headache types where medicines, I agree, are not the first line of treatment. I really try to provide it like a smorgasbord for my patients and let them select, with perhaps some guidance from the chef, as to what the best treatment is going to be in their case.

Absolutely, non-pharmacologic therapies are at the forefront of what we offer our patients. It's very important to understand that non-pharmacologic therapies, as far as we know, do not cause rebound or medication overuse headache. I'm a strong supporter of no medications when appropriate and when it can work.

Mr. McKinney:

Thanks. Thank you. I have another question that came in. Do you have any case examples of females, or if presented cases for females, would treatment be different? If so, how?

Dr. Riechers:

I can take this again if you like that, or if you have somebody ...

Dr. Marion:

Feel free. You're treating these people day in and day out.

Dr. Riechers:

I think that in my population, I see about 20% of my population is female patients. It is a very important population and a growing veteran and active duty population. There are a few things that must be taken into consideration when treating female patients. Often from a pharmacologic standpoint, we have to consider the effects of medications on their teratogenic nature. Are they going to affect the woman if she would become pregnant and potentially affect the fetus? That impacts medication selection in a significant way. On top of that, many of our patients are on birth control of some sort. There are many interactions, for example, Topiramate can lessen the efficacy of certain estrogen containing preparations used for birth control.

You really have to consider the pharmacologic differences in the population, for sure, but otherwise, outside of those factors, the pharmacologic effects and the fact that women can become pregnant and there can be an indirect impact on a potential fetus, I try to manage the patients exactly the same. I see the physical therapy interventions, the non-pharmacologic interventions we use work just as effectively. I screen all patients for comorbidities because male or female veterans and soldiers are all at risk for PTSD and any other of the common comorbidities. Medication wise, it does impact how we manage our female patients.

Dr. Marion:

Let me just follow up on that and ask you, Dr. Riechers, at a very practical level, are there any particular drugs that you're particularly concerned about in women of childbearing age and speaking out specifically about the common ones? The NSAIDs, Tylenol, tricyclics, Topiramax and other anti-epileptics?

Dr. Riechers:

Absolutely. Non-steroidals, obviously, are contraindicated in women who are pregnant. Every woman of child bearing age, I counsel them on the potential risks of any medicines I start. Sumatriptans and the Triptans do the same thing to the uterine vasculature that they do to the heart. They're contraindicated in women as well because they can have a significant impact on the fetus and the uterine blood supply.

In terms of looking at preventative agents, the Topamax I already mentioned, it's interaction with oral contraceptives, but also, valproic acid is one that I really stay away from in females. I often also stay away from it in males, to be honest with you, as well. Particularly in the female population, because it has one of the higher rates of teratogenicity of the anti-epileptics. On top of that, it causes weight gain. It can cause hair loss and a tremor. Those are side effects that no one wants. I tend to save valproic acid towards the end, but because of its particular teratogenicity, I really use even less frequently in females than I do in males.

Mr. McKinney:

All right. Please provide additional information on the severity of injury when imaging reflects third ventricle colloid cysts versus [IPH].

Dr. Marion:

Okay. Certainly with colloid cysts, with primarily talking about post-traumatic headaches and a colloid cyst is, as far as we know, is not related to trauma. That's a little off track here, but colloid cysts can form and especially if they form in the posterior portion of the third ventricle, they can block the flow of spinal fluid, the aqueduct fills into the fourth ventricle and can cause something called obstructive hydrocephalus or an increase in pressure through the spinal cord and the brain and expansion of the ventricles. That is certainly a well known cause of headaches. I suppose it could be aggravated by trauma if you had that but I'm not aware of any series like that. It's treated initially or acutely by a shunt or by a ventriculostomy to relieve the pressure, and then usually endoscopically to remove the colloid cyst.

Mr. McKinney:

Thank you. Looking at our time, I think we have enough time for probably one more question. This is probably more or less for you, Dr. Riechers. At what dosage of Topamax would you expect to start seeing some cognitive deficits?

Dr. Riechers:

Certainly, that's an important question and I know the challenge in using Topiramate for our patients is that the cognitive effects are somewhat idiosyncratic, meaning some individuals have them at a much lower dose than others. All it takes is one experience with an individual having the cognitive side effects and stopping the medication because of those cognitive side effects to cloud your future use of the medicine. There are a few things I do to try to minimize the risk of cognitive side effects.

Number one. Topiramate was initially FDA approved for the treatment of epilepsy and when it's used in epileptic patients, it needs to be dosed in a BID dosing, so twice daily. That twice daily dosing is necessary because when it was initially tested, it was tested on patients with other anti-epileptics that were enzyme inducers and it led to more rapid breakdown of the Topiramate. In patients that are taking the Topiramate for headaches, you can dose that once daily. I will dose it once daily at that time, so QHS dosing. Then your peak levels of the Topiramate occur during sleep and are less likely to cause cognitive side effects.

On top of that, my target dose, for the first step in treating these patients, is 100 milligrams. The epilepsy studies that were done were done in patients on 400, 600, and 800 milligrams of Topiramate, which are very high doses. In fact, we don't use 6 or 800 of Topiramate even for seizures anymore. At those doses, that's where you saw the high frequency of cognitive side effects. Additionally, it was shown in several post marketing studies that patients with temporal lobe epilepsy were actually the ones that had the more common difficulty with word findings and cognitive side effects. I think the way to avoid or avoid the risk of cognitive side effects is to start low. Go slow. Target once daily dosing at bed time and then to understand that if the patient isn't getting headache relief at 100 milligrams QHS, you can start to add dosing during the daytime, and actually dose in the morning and evening starting at 25 milligrams again and building that up to a goal of 100 milligrams BID.

Mr. McKinney:

All right. Thank you. I think at this time, again, I just want to remind everyone, if you want, we'll be online again after the end of the presentation for question and answer to answer a few more questions. I want to remind everyone that after the webinar to please go visit dcoe.cds.pesgce.com that's dcoe.cds.pesgce.com to complete the online CE evaluation and download or print your CE certificate of attendance. The online CE evaluation will be open through Thursday, April 28th, 2016.

I will also ask, to help us improve our future webinars, we encourage you to complete the feedback tool that will open in a separate browser on your computer. To access the presentation and resource list for this webinar, you may download them from the files pod on the screen or at DVbic website. Dvbic.dcoe.mil/onlineeducation. The audio recording and edited transcript and closed captioning will be posted to that link in approximately one week.

The chat function will remain open for an additional ten minutes, as I mentioned earlier, after the conclusion of the webinar, to permit attendees to continue to network with each other. The next DCoE TBI webinar, cognitive rehabilitation and mild TBI applications to military service members and veterans is scheduled for June 9th, 2016 from 1:00 to 2:30 PM Eastern time. The next DCoE psychological health seminar, prevention of sexual assault in children, is scheduled for April 28th, 2016 from 1:00 to 2:30 PM Eastern time. The next DVbic TBI clinical ground rounds, VA/DOD clinical practice guidelines for the management of concussion and mild TBI is scheduled for June 24th, 2016 from 12:00 to 1:15 PM Eastern time.

The call for abstracts is open through April 18th. Please submit your abstracts by April 18th at <http://dcoe.am.pesgce.com/> The 2016 DCoE summit statement of science, advantages in diagnostic and treatments of psychological health and treatment of traumatic brain injury in the military healthcare is scheduled for September 13 through 15, 2016. The summit registration and continued education information will be available soon. Again, I'd like to thank you for attending and I wish everyone a great day. A reminder that we'll be online for an additional ten minutes at the conclusion of the webinar. Thank you.

Operator:

Thank you. This does conclude today's presentation from the phone lines. You may disconnect at this time.