

CONCUSSIONS?



Can Concussions be Managed?

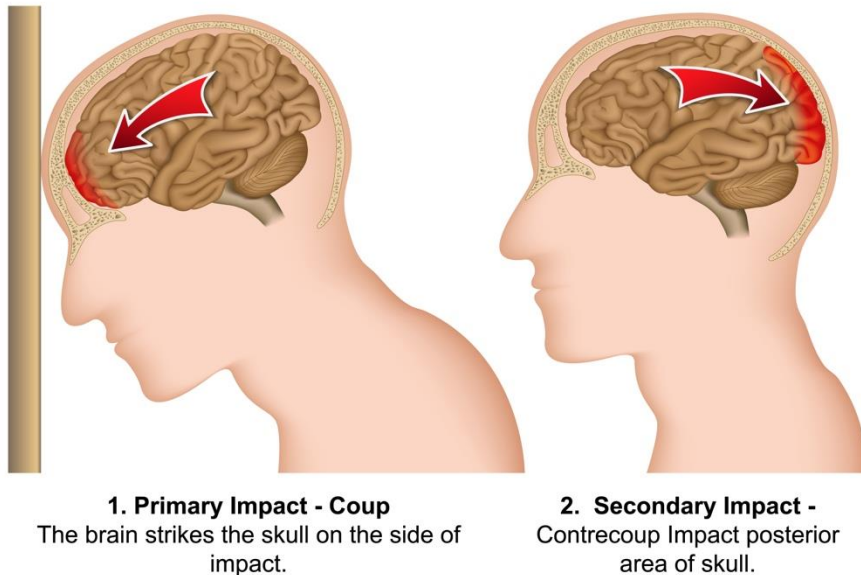
**How Long Before A Concussion
Cannot be Rehabilitated?**

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Introduction to Concussion

A concussion is a type of mild traumatic brain injury (TBI) that occurs when the brain is jolted or shaken, causing it to bounce or twist within the skull. This sudden movement can cause damage to the brain cells, leading to a range of symptoms that can vary in severity and duration.



Concussions are commonly caused by sports-related injuries, falls, car accidents, or any other sudden impact to the head. They are particularly common in contact sports such as football, soccer, and boxing, but

can occur in any activity that involves the risk of head injury.

Symptoms of a concussion may include headaches, dizziness, confusion, nausea, sensitivity to light or sound, memory problems, difficulty concentrating, etc. In some cases, these symptoms may be mild and resolve within a few days, while in others they can be more severe and last for weeks, months or even years.

It is important to seek medical attention if a concussion is suspected, as the condition can

have serious long-term consequences if left untreated. Treatment



for concussions has drastically changed over the last several years. The old “cocoon therapy” previously prescribed for concussion, e.g., extended rest, no cognitive activity, no screen time, has now been replaced with very effective management tools and procedures that will be explained later.

Recognizing Concussion

Concussions are common in contact sports, motor vehicle collisions (MVCs), falls, and other incidents that involve sudden impact or jarring of the head. Recognizing a concussion quickly and accurately is crucial to proper management and prevention of further injury.

Key concepts in recognizing a concussion include:

Mechanism of Injury

In the acute setting, observing and/or understanding the mechanism of injury is important. If an individual experiences a blow to the head, neck, or upper body, observe for concussion-induced symptoms. In sports, this may occur due to a tackle or collision, while in MVCs, it could be due to the head hitting a window or dashboard, or a whiplash-type mechanism.

Observational Assessment

Witnessing changes in behavior, coordination, balance/disequilibrium or physical function can implicate a concussion.

These might include



appearing dazed or stunned, clumsiness, slow response to questions, loss of consciousness (even briefly), changes in mood, behavior, or personality, or an inability to recall events before or after the hit or fall.

Signs and Symptoms

The following symptoms may appear immediately, or may develop minutes, hours, or even within 2-3 days following the concussive event:



• **Physical Symptoms:** These include headaches, nausea or vomiting, balance problems, dizziness, visual problems,

fatigue, and sensitivity to light or noise. Patient may report feeling “dazed” or like “in a fog”.

- **Cognitive Symptoms:** Difficulty thinking clearly, feeling slowed down, difficulty concentrating, and memory problems are common cognitive symptoms. Reaction times may be slowed.
- **Emotional Symptoms:** Mood swings, behavior changes, irritability, sadness, nervousness, and emotional lability can be signs of a concussion.
- **Sleep Disturbances:** Sleeping more or less than usual, or having trouble falling asleep can be symptoms, e.g., somnolence, drowsiness.

These symptoms may not always appear immediately after the injury and may develop hours or even 2-3 days later.

What is an mTBI?

Mild Traumatic Brain Injury (mTBI) and concussion are terms that are often used interchangeably, but there are subtle differences between the two. Both conditions involve a traumatic injury to the brain caused by an external force, such as a blow to the head or a violent shaking of the head or body. They share many similarities in symptoms and outcomes, but the main difference lies in the classification and scope of the injuries.

Mild Traumatic Brain Injury (mTBI)

- mTBI is a broader term that refers to any mild traumatic injury to the brain, which can result from various causes, such as a fall, car accident, sports injury, or assault.
- mTBI is classified based on the severity of the injury using the Glasgow Coma Scale (GCS), with scores ranging from 13 to 15 (out of 15). A score of 15 indicates a mild injury, while a lower score denotes a more significant injury.
- mTBI can result in temporary or permanent physical, cognitive, emotional, and behavioral changes. These symptoms may resolve within hours or days, or they may persist for months or even years.
- Common symptoms of mTBI include headache, dizziness, fatigue, memory problems, difficulty concentrating, irritability, and sleep disturbances.
- Diagnosis of mTBI typically involves a thorough medical evaluation, including a detailed history of the injury, physical

examination, and, in some cases, imaging studies like CT scans or MRIs to rule out more moderate or severe injuries.

Concussion

- A concussion is a specific type of mTBI, characterized by a temporary disturbance in brain function following a traumatic injury.
- The term "concussion" is more commonly used in the context of sports medicine and public awareness campaigns, but it is essentially a subset of mTBI.
- Concussions can result from a direct blow to the head or from an indirect impact transmitted through the body (e.g., a whiplash injury).
- Symptoms of a concussion are similar to those of mTBI and may include headache, dizziness, confusion, memory loss, and balance problems. However, they are generally milder and more transient, with most individuals recovering fully.
- Diagnosing a concussion typically involves a clinical examination, evaluation of signs and symptoms, and, in some cases, neurocognitive testing. Imaging studies are usually not required unless there is a concern for a more moderate or severe injury.

Are the Terms Interchangeable?

As an expert in Concussion / mTBI, the above information is offered in the interest of completeness. However, for the most part and throughout the remainder of this brochure, the terms will be considered interchangeable. The vast majority of healthcare providers are using these terms interchangeably now.

Missed Diagnosis vs. Misdiagnosis

The lack of comprehensive knowledge about concussion management prior to the 2017 Consensus statement impacted the ability of healthcare providers to identify and treat concussions effectively. It is difficult to determine the exact number of missed or untreated concussions due to knowledge gaps, as the underdiagnosis of concussions is a complex issue influenced by several factors, such as athletes not reporting their symptoms, inadequate sideline assessments, or a lack of awareness among coaches, parents, and athletes.

Unfortunately, the gap in knowledge surrounding concussion management persists. The following review will focus on several studies evaluating the knowledge base of medical students and HCPs relative to concussion management. Remember, prior to the 2017 Consensus on SRC, treatment was essentially bed rest with a “wait and see” for symptom resolution. Due to the fact there were really no specific treatment parameters, medical education did not spend a lot of time on concussions.

Concussion Recovery Misinformation

Recovery from mild traumatic brain injury (mTBI), also known as concussion, generally refers to the process through which an individual returns to their pre-injury cognitive, emotional, and functional state. Recovery can vary significantly between

individuals, but there are some common elements that may be involved that include the reduction of symptoms, restoration of cognitive activities, physiologic recovery, emotional and psychological recovery, return to daily activities, return to learning and return to play status for competitive sports. The recovery process is complicated and unique to each injured individual. Information from the internet shows a wide path of misinformation stating recovery times from 2-3 days or 7 days or an average of 10 days. The correct recovery time is based on the injury sustained, the condition and ability of the patient to follow rehabilitation protocols and the avoidance of secondary injuries that are very common with concussions.

Information from a health care provider board certified in concussion management is critical and necessary to recover.

The Neurometabolic Cascade

The neurometabolic cascade is a series of complex, interconnected biochemical reactions and cellular events that occur in the brain following a traumatic brain injury (TBI). This cascade can lead to secondary injury, which exacerbates the initial damage caused by the trauma.

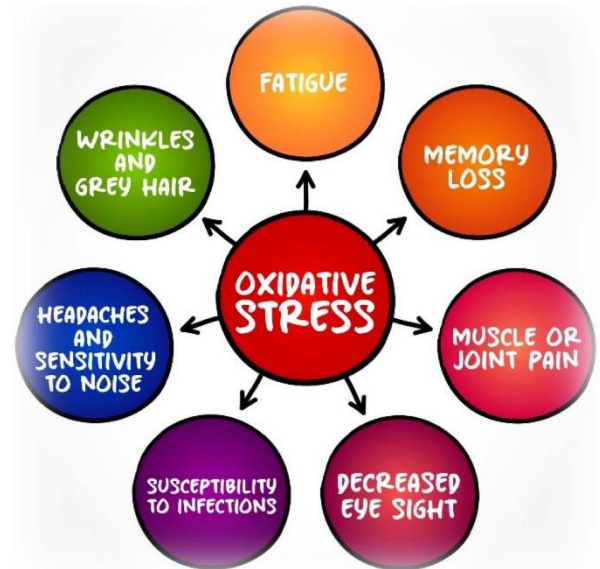
The neurometabolic cascade following a concussion or traumatic brain injury (TBI) involves a series of complex cellular and molecular events that contribute to the development of secondary injury. The excitatory phase and the spreading depression phase are two components of this cascade that contribute to the overall pathophysiology of the injury.

Usual Symptoms and Signs

Signs and symptoms of concussion are important to recognize and access. This section will explore the best ways to assess patient symptomatology.

Concussions can have a wide range of symptoms, which may appear immediately or develop over time.

Here are 22 common signs and symptoms of a concussion as proposed by the Acute Concussion Evaluation (ACE) form available from the Center for Disease Control (CDC):



Physical (10)

1. **Headache:** A persistent or worsening headache is a common symptom of a concussion.
2. **Nausea:** Nausea can be a common symptom following concussion.
3. **Vomiting:** Vomiting may occur shortly after the injury.
4. **Balance Problems:** The person may have difficulty maintaining balance or coordinating movements.
5. **Dizziness:** Feelings of unsteadiness or lightheadedness may occur.
6. **Blurred or Double Vision:** Vision problems are common after a concussion.

7. **Fatigue:** The injured person may feel excessively tired or have difficulty staying awake.
8. **Sensitivity to Light:** Bright lights may cause discomfort or worsen other symptoms.
9. **Sensitivity to Noise:** Loud sounds may cause discomfort or worsen other symptoms.
10. **Numbness / Tingling:** The person may complain of numbness or tingling sensations.

Cognitive (4)

1. **Fogginess:** Feeling mentally foggy.
2. **Feeling Slowed Down:** The injured person may feel slowed down.
3. **Difficulty Concentrating:** The person may have trouble focusing on tasks or following conversations.
4. **Memory:** Difficulty remembering new information or recalling previously learned information may occur.

Emotional (4)

1. **Irritability:** The person may be more irritable or have mood swings.
2. **Depression or Anxiety:** Feelings of sadness, hopelessness, or worry may develop after a concussion.
3. **Emotional:** The person may experience increased levels of emotion.
4. **Nervousness:** The person may have a feeling of ongoing nervousness.

Sleep (4)

1. **Drowsiness:** Due to less sleep, drowsiness is a common symptom.
2. **Sleeping Less than Usual:** Difficult to stay asleep.
3. **Sleeping More than Usual:** In contrast, some people will sleep excessively.
4. **Trouble Falling Asleep:** Difficult to fall asleep.

Second Impact Syndrome

Second impact syndrome (SIS) is a rare but potentially life-threatening condition that can occur when an individual sustains a second concussion before the first concussion has fully healed.



This condition can cause rapid and severe swelling of the brain, leading to severe neurological impairment or even death.

This is one of the primary reasons Health Care Practitioners (HCP) need to understand the concept of the neurometabolic cascade and appropriate evaluation procedures to determine when a patient is ready to Return-to-Play (RTP). Remember, managing concussions simply cannot be “symptom-driven”, particularly in youth sports.

Initial Visit

Mild Traumatic Brain Injury (mTBI) / Concussion is a common injury, especially in motor vehicle collisions, contact sports, and falls. Concussions can lead to a variety of symptoms, such as

headache, dizziness, confusion, memory problems, etc., significantly affecting a patient's activities of daily living (ADLs). The initial visit history and evaluation are essential to properly diagnose and manage the injury, as well as to determine whether emergent referral and/or diagnostic imaging are indicated.

The importance of the initial visit history and evaluation with mTBI lies in several factors.

1. First, it allows healthcare providers to assess the severity of the injury and the risk of complications, such as second-impact syndrome or post-concussion syndrome.
2. Second, it helps to establish a baseline for the patient's neurological function, which can be used to monitor their recovery over time.
3. Third, it enables healthcare providers to provide appropriate recommendations for activity modification, future evaluation and, if necessary, mTBI / PCS rehab, as well as Return-to-Work (RTW) / Return-to-Learn (RTL) and/or Return-to-Play (RTP) decisions.
4. Fourth, it provides an opportunity to identify any other injuries or conditions that may require emergent / additional treatment or referral.

Whether emergent referral or diagnostic imaging is indicated in the evaluation of an mTBI depends on several factors. Generally, emergent referral and special imaging is not necessary in most cases of mTBI, as the diagnosis is based primarily on the patient's symptoms and physical examination findings. However, emergent referral or advanced imaging may be recommended if there is concern for a more serious injury, such as a skull fracture,

intracranial hemorrhage, neurologic deficits, or brain swelling. These situations would transfer the diagnosis from mTBI to a Moderate/Severe TBI. In such cases, a CT scan or MRI may be performed to assess the extent of the injury and determine the appropriate course of treatment.

Co-Management

The treatment of concussion, a mild form of traumatic brain injury, often calls for a multifaceted, interdisciplinary approach. Ensuring the provision of optimal care may require the integration of various healthcare professionals. However, given the neurological implications of a concussion, the co-management approach with a neurologist may often be indicated.

As stated by Dr. Jeffrey Kutcher, neurologist:

“Neurologists are physicians (MD or DO), with specific training in the diagnosis and management of the entire spectrum of neurological injury and disease. This expertise is essential in the evaluation and management of patients with a suspected concussion. This is both because the diagnosis itself is often difficult to confirm, and when concussion is present, other neurological injuries and processes are almost always present as well. Neurologists are also able to utilize a wide array of treatment options, including medications, procedures, and various physical modalities. As well, they will be able to efficiently direct patient evaluation with diagnostic testing, such as MRI, CT scan, and blood work.”

Concussions often present with a wide array of symptoms, from physical manifestations such as headaches and dizziness to cognitive disruptions like memory loss and slowed processing speed. Equally important are the emotional symptoms, which can range from irritability to depression. Concussion-trained HCPs, equipped with a broad understanding of health and disease, are often the first point of contact in managing these diverse symptoms. Their knowledge of the patient's overall health, their continuity of care, and their expertise in addressing multiple concurrent health issues make them invaluable in the early identification, diagnosis, and management of concussions.

Various Evaluations

For decades, the standard approach to treating a concussion has been to prescribe rest, both physical and cognitive, until symptoms subside. The rationale behind this approach was to give the brain time to heal and reduce the risk of further injury or complications.

However, there is now growing evidence that prolonged rest following a concussion may actually be harmful and can delay recovery. Studies have found that prolonged rest can lead to physical deconditioning, which can make it harder for a patient to return to their normal activities once they are cleared to do so. In addition, prolonged rest can lead to psychological issues such as depression and anxiety, as well as social isolation.

BUFFALO CONCUSSION TREADMILL TEST

The dilemma of concussion treatment, specifically regarding the role of rest versus exercise, is a complex and evolving topic. As

discussed above, rest has been considered the primary treatment recommendation for concussion, with the aim of allowing the brain to heal by minimizing physical and cognitive activity. Current research has not supported this treatment plan, e.g., “do-nothing cocoon therapy”.

On the contrary, exercise has also been shown to exacerbate concussion symptoms. This creates a dilemma – should the patient rest or should the patient be allowed to exercise?

Fortunately, research has challenged the “rest” approach and provided a method to instigate exercise safely without worsening concussion symptoms.

VESTIBULO-OCULAR PCS EXAM

The Neurometabolic Cascade of Concussion was explained in Module 2. The symptoms of acute concussion appear to largely be reflective of the global cerebral energy crisis. The first major research paper to differentiate and identify dysfunction within specific neurological subsystems was authored by Ellis et al (2015). This paper presented a unique approach to acute concussion and PCS. The three main neurologic subsystems were Physiologic, Vestibulo-Ocular, and Cervicogenic.

Physiologic PCD (post-concussive disorder) is characterized by persistent concussive symptoms / impairments which result from continued alterations in global cerebral metabolism. Management and treatment of Physiologic PCS, caused by the global cerebral energy crisis.

In addition to Physiologic PCD, there are the other two important neurologic subsystem components in the management of mTBI --

Vestibulo-Ocular PCD and Cervicogenic PCD. This module will concentrate on Vestibulo-Ocular involvement in the development of PCS.

CERVICOGENIC PCS

Cervical injuries and concussion can share similar mechanisms and similar symptoms (Cheever et al, 2016). As a result, simply documenting symptoms alone is considered insufficient to differentiate concussions from cervical injuries. Furthermore, even though concussion and cervical injury may cause very similar symptoms, their treatment methods differ.

Currently, in the course of concussion assessment, evaluation of the cervical spine is recommended. This is not a typical orthopedic cervical examination. Instead, testing for cervicogenic components requires evaluation of the cervical somatosensory system.

BALANCE ERROR SCORING SYSTEM

BESS History

The Balance Error Scoring System (BESS) has been a widely used tool for assessing postural stability and, importantly, for assisting in the diagnosis and management of concussions in both athletic and non-athletic populations. The origin of the BESS traces back to the 1990s as experts in the field began to recognize the need for effective and accessible tools to assess concussion outcomes.

The development of the BESS was influenced by the research conducted by Dr. Guskiewicz and colleagues in the late 1990s at the University of North Carolina at Chapel Hill. They were working on ways to assess postural stability in athletes, given that

balance disturbances are a common, albeit sometimes overlooked, consequence of concussion.

Treatment of Concussion and Post-Concussion Syndrome

The Importance of Concussion Education

- Patient education is critical in the management of concussion. In the context of mTBI / concussion is a functional injury, which means that there is no structural damage to the brain, but the way it functions is altered. This can result in a wide range of physical, cognitive, and emotional symptoms. Patients and their families need to understand that concussion is a treatable injury, and that there are steps they can take to help manage the symptoms and promote recovery.
- In simple terms, the neurometabolic cascade and resultant energy crisis occurs as a result of concussion. There is a normal physiologic recovery pattern of concussion – understanding that "normal" has been primarily derived from sports-related concussions (SRC) with predominately young, healthy, athletic males. Symptoms are shown to peak within 2-3 days, with symptom resolution typically between 7-10 days. If the patient is still symptomatic after 10 days, they are not exhibiting a "normal physiologic recovery pattern".
- It is very important that you not sustain another concussion during the metabolic recovery process. The treatment plan is designed to graduate the patient's return to learn/work and return to play in a safe and evidence-based manner.

The following rehabilitation prescriptions should be considered based on clinical examination findings:

1. Sub-Symptom Threshold Cognition
2. Sub-Symptom Threshold Exercise
3. Accommodation Insufficiency Rehabilitation
4. Convergence Insufficiency Rehabilitation

What to Expect

If you begin today to follow the protocol contained herein, you can expect that we will manage your concussion quite well within a week or two. Next, you can expect to begin all the rehabilitation protocols gradually as your injury recovers. After two weeks of that, you should expect to be able to do most of the approved activities without any increase in symptoms. Your time off work should be limited to 1-10 days if all goes well. After one month on the protocol, you can expect to further reduce the treatment frequency, increase activities and exercise and move to complete recovery. It is critical that your care be managed consistently as explained.

The Right Provider

Many people have questions about the treatment protocol and finding the right provider. If you have read the information above, you should have a pretty good understanding of what needs to happen. But that is only half the battle. Finding the right provider to deliver these procedures, monitor your progress and co-manage

your concussion with the right neurologist is critical. To obtain the successful results we reference above, one must be managed by a physician board certified in neuromusculoskeletal medicine with a fellowship in concussion management who has the attention and commitment to detail necessary to insure the correct application of the treatment modalities. Medicine is an art and physical medicine is an acquired skill and art.

What does it mean to be board certified in neuromusculoskeletal medicine with a fellowship in concussion management?

The practitioner who is board certified by The International Academy of Neuromusculoskeletal Medicine (NMSM) is a physician holding a license by the state to practice allopathic, osteopathic or chiropractic medicine. He has extensive, specialized training in physical examination and treatment procedures emphasizing primarily the neuromusculoskeletal structures of the body including the spine and the extremity joints. This involves conditions affecting bones, joints, muscles, tendons, ligaments, cartilage and related nerve structures.

The board certified specialist handles both acute health problems such as automobile accidents and sports injuries as well as more chronic conditions including disc disease, arthritis, scoliosis, and fibromyalgia. Advanced procedures of x-ray, magnetic resonance imaging (MRI) and computed tomography imaging (CT), electro diagnostic studies, diagnostic ultrasound, nerve conduction studies (EMG) and clinical laboratory procedures are used to assist in the diagnostic process when indicated.

In the course of treatment, this specialist applies manipulative/adjustive procedures along with other treatment options such as computerized axial distraction, ozone injection, physiologic therapeutic modalities, nutritional counseling, structural supports, corrective devices, exercise and rehabilitation regimens, preventive care advice and home therapy programs for patient health.

The fellowship in concussion management is quite rare and most providers in all professions do not have up-to-date skills in managing concussions. It is crucial to have the

Is this protocol better than seeing a regular chiropractor, physical therapist or medical doctor?

The Berlin Consensus of 2016 and the Amsterdam Consensus of 2022 dramatically changed how concussions are to be managed successfully. Provides with training prior to 2023 who have not taken current advanced training in concussion management will not be aware of the shift in management protocols and will not be of much help in managing your case. In most cases, seeing a specialist board certified in NMSM is better than seeing a regular chiropractor, physical therapist or medical specialist because the NMSM specialist is well trained and certified as having the necessary skills of all three of those providers. He has the diagnostic skills not possessed by the physical therapist, has the manipulative skills not possessed by the medical specialist, has the diagnostic and management skills not generally possessed by the regular chiropractor and he has the skill and experience to enlist the skills of each of these others should the need arise.

If I've already seen a chiropractor, physical therapist or medical doctor, can I still see the board certified NMSM specialist?

Starting with any of these providers or having been to the Emergency Department at the hospital only makes your visit to the NMSM specialist that much easier. He will request your records and simplify your intake process so that you can get on the path to recovery and prevention of disc disease. He will work well with any of these other providers to take advantage of everything they provided for you and increase the effectiveness and outcome of any program you may have already started.

Literature Review

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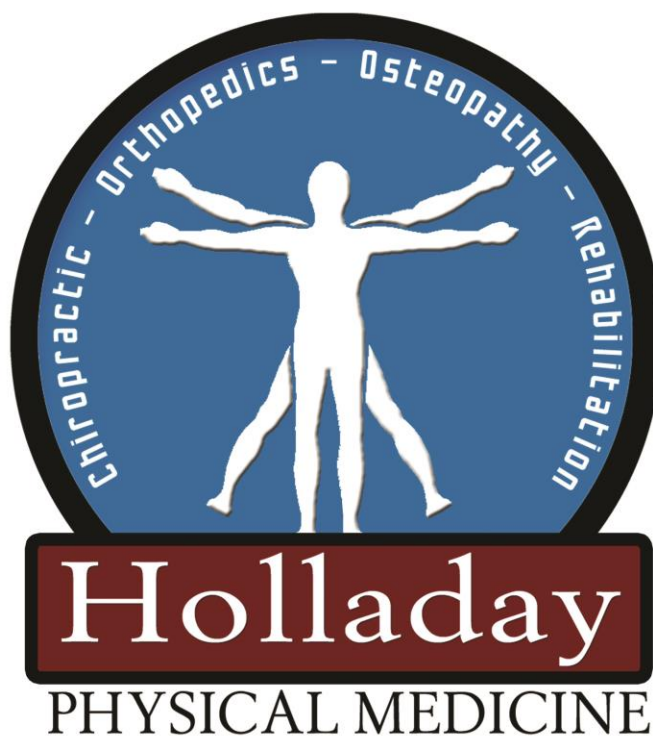
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