EDITORIAL:

THE PHYSICIAN’S ROLE IN THE DISABILITY REALM

In the realm of patient care, treating physicians are accustomed to attending to patients independently. Their input into patient care is peremptory, and their treatment decisions are final. At the center of this realm is the patient with an illness or injury, and decisive responsibility rests with the treating physician.

The realm of disability medicine, however, involves a larger system which includes more than just the treating physician-patient-illness triad. Disability is a realm within our civilized world involving the determination of inability to function in society because of illness or injury and the disbursement of funds to compensate for such inability. Only in so far as it determines the ability to function, or only in so far as it affects disbursement of funds does treatment necessarily even enter the disability picture.

As a product of civilization, disability involves a legal aspect. The disbursement of funds for compensation for inability to function due to illness or injury in our civilized world mainly occurs within a judicial system. Thus, the physician does not have the single decisive role that she may have in the customary attending physician role; but the physician becomes one of several professionals involved in a larger realm which includes the patient, the illness or injury, the ability to function in society, and the disbursement of funds. It is an orchestration of appropriate input from each of the involved professionals which finally gives rise to the ultimate disbursement of funds to compensate for what the injured or ill individual is not able to do for him/herself in society.

According to the AMA Guides to the evaluation of permanent impairment the physician’s role in this large disability orchestration is to estimate a patient’s impairment objectively. From there, issues of ability to function in society and disbursement of funds are determined in the larger realm. In this realm, the physician’s role – for instance as the Independent Medical Examiner – is not peremptory, but it is nonetheless an integral part of a larger process.

The field of Independent Medical Evaluation is full of land mines. Physician experts cannot help but be accused of being in the pocket of one side or another. In the past decade, expert witness testimony has come under increasing fire by higher court decisions. Increasingly, it is not good enough to testify and get one’s opinion accepted by the legal system without basis in scientific knowledge. To familiarize our readers to these issues, we are fortunate to have an article by West Virginia Supreme Court Chief Justice Warren R. McGraw in this issue. In Judicial Overview of Expert Scientific Testimony for Independent Medical Examiners - A Perspective from the Bench, the Chief Justice and his colleague explain the rules governing expert witness testimony. Through understanding of these rules of this larger process, the Independent Medical Examiner can perhaps better function as an integral part of the disability orchestra.

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President’s Message

Physician interest in training and education as well as certification through the American Board of Independent Medical Examiners (ABIME) continues to be strong. ABIME certified 376 physicians this year bringing the total to 2429 total physicians listed in the ABIME National Directory. ABIME Educated 623 physicians through our ABIME Certification Review and AMA Guides to the Evaluation of Permanent impairment 4th and 5th Edition Training Course.

ABIME will be conducting courses through 2002 followed by the certification exam. This year we have added a new workshop for attendees presented by Rob Sherman called “How to Communicate with Power and Influence: The keys to success for an expert witness”.

Beginning this year ABIME has established the Board of Registry. Certified physicians will be listed in the print directory and online at www.abime.org. The online roster is designed to meet the needs of physicians and referral sources. It provides a searchable database with worldwide up-to-date information on all certified physicians. Other benefits included with the Board of registry are delivery of the quarterly Journal Disability Medicine and discounted rates on education programs and insurance.

This year promises to be interesting and exciting with these new developments at ABIME and growing interest in the field of disability medicine. Please feel free to contact me with any comments or questions you may have.

Thomas A. Beller, MD, CIME
President
American Board of Independent Medical Examiners

General Information – Disability Medicine, Volume 1, Number 2

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THE CONTRIBUTION OF NEUROPSYCHOLOGICAL ASSESSMENT IN THE DETERMINATION OF IMPAIRMENT AND DISABILITY FOR PERSONS WITH MILD TRAUMATIC BRAIN INJURY

Donald M. Dow, PhD, Edward A. Maitz, PhD, Steven Mandel, MD, John E. Gordon, PhD, Joely Esposito, PsyD, and David J. Massari, PhD

Introduction: Physicians who evaluate patients for the purpose of making disability or impairment determinations often assess patients with mild traumatic brain injury. Unfortunately, in many situations, especially in instances when abnormalities on MRls and CT scans are not present, physicians may lack objective measures on which to base their decisions. As a result, they are required to incorporate and integrate subjective and often disparate information in order to arrive at conclusions regarding the nature, etiology, and degree of cognitive impairment.

Neuropsychology is a subspecialty within psychology that examines the relationship between the brain and behavior. It is predicated on the assumption that virtually all behavior, including sensory, motor, cognitive, and psychological functioning is mediated by the brain. A neuropsychological evaluation provides quantitative data regarding the integrity of these brain-related functions. Neuropsychological tests are empirically based and norm-referenced, and can be corrected to account for age, education, and gender. Because certain behaviors are controlled by specific areas of the brain, neuropsychological testing provides a neuropsychologist with the means to make inferences regarding the integrity of the cerebral cortex and its pathways, and subsequently to make diagnostic statements concerning the presence of neurological illness, trauma, or decline. Neuropsychological findings can provide a physician with an objective means to document neurological impairment and disability, or the lack thereof.

Neuropsychological assessment facilitates the determination of impairment and disability in patients with suspected neurological abnormalities. As a means to highlight the value of incorporating a neuropsychological perspective into this process, the following points will be addressed. First, the nature of clinical neuropsychology will be identified. Second, areas evaluated in a comprehensive neuropsychological assessment, and different types of neuropsychological test batteries will be reviewed. Third, the process of incorporating neuropsychological findings into the determination of impairment and disability will be discussed. And finally, the symptoms that are typically associated with a mild traumatic brain injury will be reviewed.

Clinical neuropsychology: Psychology is a broad field that addresses many aspects of human behavior. And while clinical neuropsychologists may work with, and be knowledgeable about other areas of psychology, (e.g. substance abuse, depression, anxiety), they are uniquely trained to assess cognitive impairment secondary to conditions such as neurotrauma or disease processes. Clinical neuropsychologists, trained in neuroanatomy, neurophysiology, and neurodiagnostic techniques, also hold a doctoral degree in psychology from an accredited institution, have completed post-doctoral training in neuropsychology, maintain a professional license, and may be certified by the American Board of Clinical Neuropsychology or the American Board of Professional Neuropsychology.1,2
Neuropsychologists provide assessment and treatment to patients who experience cognitive and emotional difficulties due to reasons such as closed head injury, anoxia, or degenerative neurological condition. Their work often helps to distinguish between different cognitive-related diagnoses. Furthermore, neuropsychologists frequently provide expert testimony to help delineate the relationship between organic and behavioral abnormalities.

**A comprehensive neuropsychological assessment:** The fundamental goal of a neuropsychological assessment is to determine the relative cognitive strengths and limitations of a person based upon the patient’s behavior during the assessment, and to relate these strengths and weaknesses to the structural and functional integrity of the brain. A comprehensive neuropsychological assessment integrates a thorough clinical interview with the patient’s history, medical records, and the results of formal objective and standardized testing. Assessments are typically performed over the course of one day. The duration of the clinical interview and the objective testing is often dependent upon the rate and quality of the patient’s performance; however, the assessment is typically completed in about six hours.

A standardized neuropsychological assessment systematically and comprehensively evaluates brain-related functions. Assessment instruments are designed to sample a variety of cognitive abilities and skills such as intellectual and academic functioning, speech and language abilities, auditory and visual perception, attention and concentration, learning and memory, motor and sensory functioning, cognitive flexibility and conceptual reasoning, psychological and emotional dynamics, and motivation. Many of these functions have been correlated to specific areas of the brain. Hence, inferences regarding the functioning of the patient’s brain can be made based upon the patient’s performance on these formal measures.

A neuropsychological evaluation is typically performed at least several weeks after a traumatic event such as a stroke or closed head injury. This delay is warranted due to the often rapid changes in neuropsychological functioning during the acute and post-acute stages of recovery. However, in other instances, such as when a degenerative disease is suspected, an immediate evaluation may be more prudent – not only to help diagnosis the condition, but to also serve as a baseline to track future cognitive changes. Once the assessment is complete, a variety of questions can be addressed such as: Is there cerebral impairment? What is the severity of the impairment? Is the condition progressive or static, diffuse or lateralized? What is the nature, etiology, and prognosis of the impairment? What are the specific treatment recommendations? And subsequently, what are the implications for impairment and disability?

While certain neuropsychological tests provide specific data, neuropsychologists utilize a battery of tests rather than a single assessment instrument. Hence, rather than just merely examining a particular behavior or a specific level of performance, neuropsychologists are able to integrate patterns of performances across a variety of tested domains. It should be stressed that only professionals with appropriate training in both neuropsychology and psychometrics should attempt to interpret results from neuropsychological assessments. While an exhaustive review is beyond the scope of this article, a summary of common neuropsychological assessment instruments and their functions is provided in Table 1.

In addition to the assessment instruments identified in Table 1, objective measures of personality and motivation are often included in neuropsychological assessments, particularly in cases when the patient may potentially be involved in litigation. There are several tests such as the Rey 15 Item Memory Test, the Test of Memory Malingering, and the Portland Digit Recognition Test 25 that are commonly used to help determine if
the patient is malingering or failing to provide his or her best effort. However, in addition to specific instruments, there are also sources of data embedded within a comprehensive neuropsychological assessment that allow the neuropsychologist to make inferences concerning consistency of effort and motivation. Additionally, the aforementioned findings are frequently integrated with the results from tests such as the Minnesota Multiphasic Personality Inventory-II,26 the Beck Depression Inventory-II,27 and the Beck Anxiety Inventory,28 to provide the neuropsychologist with information related to personality, psychopathology, and mood.

Fixed vs. Flexible Batteries. As previously mentioned, neuropsychologists do not use a single test to make inferences, but rather utilize a series or battery of tests from which to draw conclusions. While a variety of assessment approaches have been developed,29,30 neuropsychological batteries can be divided into two broad approaches: fixed and flexible batteries.

A fixed battery is a standard or pre-identified grouping of neuropsychological tests. At times additional or supplemental tests may be added, but the core of the battery remains intact. The most common and widely used fixed battery is the Halstead Reitan Neuropsychological Test Battery. It is comprised of the Category Test, Tactual Performance Test, Finger Tapping Test, Speech-Sounds Perception Test, Seashore Rhythm Tests, Trails Making Test, Aphasia Screening Test, and Sensory Perceptual Exam. The validity for the constellation of these tests as a neuropsychological battery has been well established.14,31 It is common for neuropsychologists who utilize the Halstead Reitan Battery to supplement this battery with several other tests such as the Wechsler Adult Intelligence Scale, and the Minnesota Multiphasic Personality Inventory-2.4,5,27

In contrast to a fixed battery, a flexible battery is a unique cluster of tests that a neuropsychologist selects in order to answer the specific assessment questions for a particular patient. The components of flexible batteries reflect...
much more variability than fixed batteries; consequently, flexible batteries may or may not use components of a traditional fixed battery. Advantages of a flexible approach may include decreased testing time and increased information about a specific cognitive domain. However, one disadvantage of such an approach is that the battery may fail to detect specific deficits for which the neuropsychologist was not looking.

While there are strengths to both the fixed and flexible approaches, there are several reasons why a fixed battery may be more advantageous. First, a fixed battery assesses a broad range of cognitive domains, hence offering a more representative sample of the relationship between the functioning of the patient’s brain and his or her behavior. Second, while both fixed and flexible batteries may be able to identify specific cognitive limitations, fixed batteries are uniquely suited to identify strengths in areas of cognitive functioning; such information may prove invaluable in the process of providing treatment rehabilitation recommendations or determining disability. And finally, the fixed approach provides a greater assurance of validity. In Chapple v. Ganger, a federal court applied the Daubert Principle to the use of fixed and flexible neuropsychological batteries.32 The court favored the fixed Halstead-Reitan Neuropsychological Test Battery over two flexible neuropsychological batteries. In short, the decision was based upon the lack of scientific evidence to validate the conclusions made from the flexible batteries.

Determining Impairment & Disability for Patients With Mild TBI. The Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine has provided the following statement to help define mild traumatic brain injury: “A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of brain function, as manifest by at least one of the following:

1. Any period of loss of consciousness.
2. Any loss of memory for events immediately before or after the accident.
3. Any alteration in mental state at the time of the accident (e.g. feeling dazed, disoriented, or confused).
4. Focal neurological deficit(s) that may or may not be transient.

But where the severity of the injury does not exceed the following: loss of consciousness of approximately thirty minutes or less; after thirty minutes, an initial Glasgow Coma Scale (GCS) of 13-15; Post-Traumatic Amnesia (PTA) not greater than 24 hours.”34

Inherent in this definition is the fact that an individual who does not sustain a direct blow to the head or does not experience unconsciousness may still sustain a mild TBI – despite an absence of abnormalities on MRIs and CT scans. Thus, the diagnosis may be a very difficult one to make because the “objective” neurological signs that would help to make a diagnosis (e.g. loss of consciousness, abnormalities on MRI or CT scans) are often lacking. Consequently, physicians are forced to rely upon subjective clinical impressions and the patient’s self-report. A comprehensive neuropsychological evaluation can provide the physician with objective measures to help him/her in the diagnosis process.

The Fifth Edition of the AMA Guides to the Evaluation of Permanent Impairment defines impairment as “a loss, loss of use, or derangement of any body part, organ system, or organ function.”35 Impairments are viewed in a more absolute sense and are reflective of functional limitations of common activities of daily living (ADL). Impairment evaluations are conducted by a licensed physician, and serve as one component in the determination of disability. Disability, on the other hand is defined as “an alteration of an individual’s capacity to meet personal, social, or occupational demands or statutory or regulatory requirements because of an impairment.”35 Hence, disabilities are understood contextually, rather than defined by an absolute standard. Two individuals with the same level of impairment may
experience different disabilities based on differences in occupational or social demands.

When a physician determines the level of impairment or disability of a patient with traumatic brain injury (TBI), there are a variety of techniques that may be utilized such as: the physician’s clinical impressions, the patient’s history, the results from medical tests, and the results from mental status exams such as the Mini Mental State Exam (MMSE). However, performance on measures such as the MMSE are often influenced by non-brain related factors such as depression, anxiety, medication effects, and the level of the patient’s motivation. While the aforementioned means are valuable tools to help determine the level of impairment, they may fail to identify the subtle but important cognitive and functional changes associated with mild TBI. These changes are more accurately identified and quantified during a comprehensive neuropsychological exam.

For example, the Guides provide criteria to assess mental status impairment of patients. In this process, the physician assesses memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. While information from clinical studies (e.g. MRI, CT, EEG, MRA, SPECT and PET), histories, and physical examinations can be utilized, the physician may still be left without substantial objective criteria to assess the patient’s actual functional and cognitive abilities. A mildly abnormal MRI may not actually result in impaired functioning. However, a comprehensive neuropsychological assessment not only objectively measures cognitive constructs such as memory, orientation, judgment and problem solving, but utilizes norms that account for age, gender, and education, enabling the neuropsychologist to interpret the results within the context of other factors such as level of effort, emotional distress, and medication effects.

While impairment evaluations and impairment percentages contribute to the determination of disability, a linear correlation between impairment and disability does not exist; disability is determined in part by the specific occupational or social demands of the patient. However, data and insight gleaned from a neuropsychological assessment may be directly applicable to and facilitate the determination of a person’s disability. For example, a comprehensive neuropsychological examination can provide a norm-referenced assessment of a person’s grip strength, finger dexterity, and tactile memory – all factors which may be considered when determining an individual’s ability to complete the tasks of an auto mechanic or maintenance worker. Similarly, objective data delineating a person’s deductive reasoning skills, attention, and concentration may be necessary when assessing the ability to perform duties associated with computer programming or engineering. While neuropsychological assessment in and of itself cannot provide an absolute answer regarding a person’s disability, it does offer invaluable information to facilitate such a determination. Furthermore, by providing a comprehensive objective baseline across a number of areas of functioning, the neuropsychological assessment also facilitates the determination of improvement/recovery or deterioration.

**Symptoms Associated with Mild Traumatic Brain Injury.** There are a variety of symptoms that a physician may choose to review with an individual who has experienced a mild TBI. In addition to determining the frequency and severity of the reported symptoms, it is important to determine post-injury changes in functioning. Symptoms frequently associated with mild TBI can be grouped into one of the following three categories: physical, cognitive, or emotional. Specific examples of frequently reported symptoms or difficulties associated with mild TBI are shown in Table 2. Many of these symptoms may also be associated with other medical and psychological problems, and are not specific to mild TBI. It is precisely for this reason that a neuropsychological assessment may be warranted to assist in a differential diagnosis.
TABLE 2: Symptoms Associated with Mild Traumatic Brain Injury

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th>COGNITIVE</th>
<th>EMOTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>Attention/concentration</td>
<td>Frustration</td>
</tr>
<tr>
<td>Tinnitus</td>
<td>Memory</td>
<td>Anxiety (specific)</td>
</tr>
<tr>
<td>Balance</td>
<td>Prospective memory</td>
<td>Depression</td>
</tr>
<tr>
<td>Coordination</td>
<td>Verbal expression (e.g. word finding, organizing thoughts)</td>
<td>Irritability</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Slowed thinking</td>
<td>Heightened emotionality</td>
</tr>
<tr>
<td>Vision (e.g. blurriness, double, light sensitive, etc.)</td>
<td>Difficulty concentrating with background noise</td>
<td>Withdrawal from family/friends</td>
</tr>
<tr>
<td>Hearing (e.g. sensitivity to noise)</td>
<td>Doing more than one thing at a time</td>
<td>Increased startle response</td>
</tr>
<tr>
<td>Touch</td>
<td>Mental fatigue</td>
<td>Personality change</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Switching between tasks</td>
<td>Reduced self-confidence</td>
</tr>
<tr>
<td>Nausea</td>
<td>General distractibility</td>
<td>Reduced self-esteem</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>Increased effort to complete task</td>
<td>Fear of “going crazy”</td>
</tr>
<tr>
<td>Clumsiness</td>
<td>Increased time to complete task</td>
<td>Excessive concern over physical well-being</td>
</tr>
<tr>
<td>Increased sensitivity to alcohol</td>
<td>Disorganized thinking</td>
<td></td>
</tr>
<tr>
<td>Sense of taste</td>
<td>Problems reading (e.g. recall, comprehension)</td>
<td></td>
</tr>
<tr>
<td>Sense of smell</td>
<td>Problems doing math (e.g. written, mental)</td>
<td></td>
</tr>
<tr>
<td>Sexual interest/activity</td>
<td>Problems spelling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trouble making decisions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Difficulty solving problems</td>
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</tbody>
</table>

**Conclusion:** Comprehensive neuropsychological assessments typically distinguish organic brain damage from a variety of other conditions such as impaired cognitive functioning secondary to psychological and emotional issues, disruption of brain functions without detectable structural damage, and malingering. As a result, neuropsychological assessment has been found to be more sensitive than bedside examinations and is the standard for the assessment of cognitive dysfunction of individuals with mild TBI.38

Presently, a comprehensive neuropsychological evaluation offers the best approach to obtaining measures of brain functioning while simultaneously accounting for the influence of extraneous factors. The findings from such an evaluation not only provide a physician with valuable information to help guide treatment, but also furnish an objective means by which future changes in cognitive functioning, and therefore disability, can be measured. Furthermore, in the case of patients with mild traumatic brain injuries, the results of a neuropsychological assessment provide a physician with the means to integrate objective norm-referenced data into the process of determining a patient’s level of impairment and disability.
2. Two individuals with the same level of ___________ may experience different _________ based on differences in occupational or social demands.
   a) disability, impairments
   b) impairment, disabilities
   c) brain injury, impairments
   d) education, cognitive impairment

3. Neuropsychological assessment provides a physician with the means to integrate __________ into the process of determining a patient’s level of impairment and disability.
   a) psychological theory
   b) objective norm-referenced data
   c) vocational aptitude
   d) job performance

4. In Chappell v. Ganger, a federal court applied the Daubert Principle to the use of fixed and flexible neuropsychological batteries, and favored a fixed neuropsychological test battery over two flexible neuropsychological batteries. This decision was based upon
   a) the lack of scientific evidence to validate the conclusions made from the flexible batteries.
   b) the specific neurological impairment of the plaintiff.
   c) the order in which the batteries were administered.
   d) the number of tests administered.

5. For a patient to be diagnosed with a mild traumatic brain injury, he or she must display focal neurological deficits.
   a) True
   b) False

Answers to these questions will appear in the next issue.
Abstract
Evidence in medical literature has mounted for some time now to support that multidisciplinary treatment teams (MDTs) for chronic pain populations can: 1) decrease medical treatment costs; 2) maximize treatment outcome; and 3) decrease the risk that restored workers will have another work-related injury. This information applies primarily to chronic pain patients but also has implications for all injured workers in treatment. This article discusses treatment goals, considerations, and possible outcomes with a large focus on the role of psychologists as members of MDTs.

Chronic pain is defined as pain in excess of three months. Multidisciplinary pain centers are defined here as having team members who work within the same clinical space, share one patient record and regularly update treatment strategies of active cases. They are further defined here as including as a minimum: a physician; a psychologist or psychiatrist; a physical therapist; and a specialized nurse consistent with the requirements of the Commission on Accreditation of Rehabilitation Facilities.

Introduction
MDTs are uniquely designed to meet the complex challenges of treating chronic pain patients with their signature biopsychosocial complexities. Their history of success led to current standards for the design of their unique process strategies. The psychologist team member preferably has a background in medical psychology with a rehabilitation focus as well as knowledge of other team members’ disciplines and specialties.

Psychological treatment provided in a MDT differs from solo clinical practice as orchestral music differs from that performed by a solo musician. MDT team members merge the physiological and psychological into an integrated, biopsychosocial model. Team members harmonize with one another in much the same way as musicians in an orchestra. Treatment of chronic pain patients is most effectively performed in concert.

Treatment Goals
Primary treatment goals of an MDT are pain reduction and restoration of physical and mental functioning, ideally to pre-injury levels. Achievement of these goals maximizes the probability of return to work, and also equates to maximum medical improvement.

Team members develop discipline-specific secondary goals to serve...
primary goals. Typical psychological goals include cognitive and behavioral strategies for positive management of: pain; depression; anxiety; sleep; drug use; motivation; family dynamics; and the diverse stressors inherent in chronic pain and loss of function. Specific examples of these stressors include loss of structured daily routines, sexual dysfunction secondary to pain and mood, as well disruptions in normal family dynamics. All team members share the same goals to facilitate effective patient reinforcement and to maintain process harmony.

An illustration of a third party system promoting these treatment goals is the West Virginia Workers’ Compensation guidelines. They have stated that psychological goals may include: 1. Helping the patient deal with the grief and loss over altered function and having to cope with chronic distress and a changed lifestyle; 2. Countering attitudes against recovery; 3. Focusing motivation; 4. Appreciating primary, secondary and tertiary gains; and 5. Identifying and treating any psychiatric diagnosis1.

**TREATMENT CONSIDERATIONS**

Patient education is an integral and necessary aspect of this process. MDTs encourage active patient participation through all phases of treatment, requiring the patient to develop cognitive and behavioral pain management skills as well as a sense of control over a life marked by loss and unanticipated changes. Team psychologists address any specific psychological barriers to treatment. These barriers may be physical or psychological. For example, in traditional medical treatment of work-related low back pain, an unrelated wrist injury may go untreated without interfering with back treatment. However, a patient’s psychological functioning cannot be similarly compartmentalized. For example, the death of a spouse or marital conflicts are as likely to interfere with treatment progress as much as problems more directly caused by the original injury.

**CONSEQUENCES OF STRESSORS**

Relative to the above goals and treatment concerns, a report in “Mental Medicine Update”2 addresses the impact of stressors on the healing process. In this article, 13 healthy women who had been caring for a husband or mother with Alzheimer’s disease for seven years (7 hours per day) were studied and compared to a control group. All women had a pea-sized punch biopsy from the inner arm. Results showed that those who cared for the Alzheimer’s patients took an average of nine days longer to heal. What was surprising, however, was that the slower healing occurred despite the fact that more of the controls were unmarried and smoked: two factors that can undermine immunity. The link between stress and healing time was clearly demonstrated.

Equally compelling are the cost containment issues served by treatment of stress and psychological diagnosis. A report in “Mind\Body Health Newsletter”3 offered relevant findings in regard to the costs of not treating psychological problems. “Examining accounting records of some 12,000 HMO patients of Group Health Cooperative of Puget Sound, researchers found annual medical costs for patients with depression to be double those of patients not diagnosed with depression....Significant cost increases were identified in every category of care including primary care, medical specialty, medical inpatient, pharmacy and laboratory....Even after adjusting for chronic conditions, costs for the depressed group were typically 1.5 times those of the comparison group. Patients receiving focused mental health treatment reduced overall medical costs by 22% over a year and a half while costs rose by 22% for those not offered any mental health treatment.”

Additional cost analysis information has been cited by Sheldon H. Preskorn, M.D. who states in his book3, “Patients with depression have a high incidence of utilization of medical services in comparison to patients who are not depressed.” The consensus of cited information offers compelling economic justification to
comprehensively diagnose and treat these problem areas.

**CONSEQUENCES OF SLEEP DEPRIVATION**

Evidence indicates it is impractical to treat chronic pain patients without addressing the pervasive sleep problems in this patient population. Sleep is the foundation of the quality of our performance and our strength to endure the demands of pain and the rehabilitation process. "To feel normal, act normal" is a phrase that should guide patient’s treatment participation. Acting normal means sleeping normally as well as engaging in a normal amount of exercise and social activity. People who feel normal act normal. This often leads patients to the mistaken belief that they should wait until they feel normal to act that way. Normal sleep, exercise and activity are foundations to feeling normal. In rehabilitation, the activity must usually precede the feeling. The most fundamental and powerful of these foundations is sleep.

In, “Insomnia: Assessment and Management in Primary Care”4, Dement writes, “Patients with chronic insomnia frequently complain of mood changes (e.g. depression, irritability), difficulty concentrating, and impaired daytime functioning...Insomnia appears to contribute to increased rates of absenteeism, health care utilization, and social disability.”

One example of the consequences of sleep deprivation occurred on March 24, 1989 when the Exxon Valdez made a planned turn out of the shipping channel in the clearest of conditions and didn’t turn back in time, resulting in a catastrophic disaster. Cost of the cleanup was $2 billion and the Exxon Company was assessed $5 billion in punitive damages. The National Transportation Safety Board eventually identified the direct cause of the accident to be sleep deprivation. The story repeats with Three Mile Island, the Challenger, and others. (Please refer to “ADDENDUM A” for additional detail regarding these incidents).

Almost 100% of chronic pain patients treated in pain centers suffer significant sleep deprivation. This may be as obvious as 2-3 hours sleep per night (inadequate quantity) or as misleading as ten hours of non-restorative sleep (impaired sleep architecture). Chronic pain typically impairs deep sleep (Stages III & IV) which is speculated to be especially critical in rehabilitation. Other common sleep problems that require treatment and may be caused by injury include: Restless Leg Syndrome: Periodic Leg Movements, and Sleep Apnea. Sleep problems represent a formidable barrier to treatment progress. Identification and treatment of sleep problems is an opportunity to facilitate treatment outcomes while minimizing current and future safety risks.

According to William C. Dement, M.D., Ph.D., a noted sleep pioneer, half of us mismanage our sleep to the point where it negatively affects our health and safety. In a survey by the National Sleep Foundation, 23 percent of the people polled admitted to falling asleep while driving in the past year. An estimated 24,000 people die each year in accidents caused directly by falling asleep at the wheel.

Dr. Dement’s writings offer a frightening insight into the risks of sleep loss and our limited awareness of the problem: “When people sleep only four hours a night for two weeks, their performance scores are the same as those of people who were kept up for three straight days and nights....After 24 hours awake, the sleep-deprived group had the same coordination deficits as those with the maximum blood alcohol level, 0.1 percent.”

Chronic sleep loss degrades nearly every aspect of human performance: vigilance (ability to receive information), alertness (ability to act on information), and attention span. Related studies indicate that subjects’ motivation to respond, more than their capacity to do so, was the primary factor in the deterioration of their cognitive and motor performance during sleep deprivation.
A meta-analysis by sleep researchers reexamined 56 sleep studies and found that mood is affected more by sleep deprivation than are either cognitive skills or physical performance. Sleep-deprivation studies have consistently shown sleep-deprived subjects to be more irritable, more volatile, and more depressed than control subjects. These findings are almost universal in the chronic pain patients we hope to functionally restore.

Combined, these data support the position that normal sleep should be a primary goal in the treatment of chronic pain patients. In the absence of adequate sleep patterns, what can we reasonably expect as treatment outcome. We risk patients returning to the employer with safety risks equal to an inebriated worker.

Medication alone can aid normal sleep restoration. However, many medications used to promote sleep can disrupt normal sleep architecture. Psychological services can assist in the management of sleep problems. Psychologists can assist patients to develop behavioral strategies that promote normal sleep. Behavioral strategies have been shown to be effective interventions for sleep restoration.

**PAIN MEDICATIONS**

Understanding by all involved practitioners of patients’ medical regimens is crucial. This could be problematic in solo practice, because without the prescribing physician’s input, a psychologist may pursue conflicting goals regarding a patient’s drug use pattern. For example, the psychologist may be attempting to have a patient reduce opioid use while the physician’s intent is patient compliance for adequate pain control.

In an MDT, medications are prescribed by the team physician who typically has specialized training and knowledge in addiction and behavioral medicine. Medication goals are set by the physician and become shared goals of all team members. Examples include limiting or eliminating opioids, benzodiazepines or alcohol. Medical and non-medical management of mood or anxiety disorders should also be addressed, as management of these disorders can reduce escalation of opioid use or addiction. Also, patients can become rapidly addicted to the psychotropic properties of opioids as opposed to the analgesic properties. Team psychologists contribute by profiling the patient’s potential for dependency and addiction. Team psychologists should have training and experience in addiction medicine as well as psychopharmacology to be able to complement the physician’s philosophy.

Historically, treatment for drug or alcohol dependence and/or addiction is marked by dismal outcome statistics. MDT’s are in a unique position to help manage this problem with improved outcomes due to the complex, coordinated resources brought to bear on the problem.

**PRESURGICAL PSYCHOLOGICAL EVALUATIONS**

In MDTs where procedures are commonly performed, psychologist team members should be skilled in evaluating patient’s psychological appropriateness for implant pain devices such as spinal stimulators and morphine infusion pumps. Since these are complex assessments, the psychologist must have knowledge of the implant procedures and outcomes as well as experience in established protocols for these specialized evaluations.

Psychological testing of chronic pain patients assists in development of accurate clinical profiles. Third party payors sometimes take the position that psychological testing is unnecessary. The clinician’s judgment should define the most accurate level of opinion. At the same time, appropriate testing is as critical in psychological evaluations as in other areas of medicine.

Contemporary psychological tests have been developed for these specialized settings and purposes. Traditional instruments such as the MMPI-2 are still often used. A number of tests have been specifically designed for these purposes...
and offer unique interpretative and predictive support in the evaluative and treatment processes. Among these specialized instruments are: the Battery for Health Improvement, the Behavioral Assessment of Pain, and the P-3.

**RISKS OF UNTREATED PSYCHOLOGICAL PROBLEMS**

Return to work with full recovery implies that all psychological issues are resolved and that normal, restorative sleep has been achieved. Workers returned without meeting these goals represent the risks and problems that have described throughout this article.

Considering the information and research provided above, it is obvious that ignoring the pervasive psychological and sleep problems in chronic pain patients can be profoundly detrimental to all stakeholders. Not treating these problems can result in:

- Increased medical costs
- Extended treatment times (increased delay in return to work)
- Significantly diminished success in achieving pre-injury functional restoration
- Increased risk of injury on the job leading to additional injuries
- Higher rates of absenteeism back on the job

Patients who return to work without sleep and mood normalized can represent safety risks equal to that of workers who would be considered legally inebriated on the job. This issue can partially account for the high percentage of injured workers having a second work injury. The clinical problems are magnified by increased injury-related costs to the employer and to the public. Residual costs may include higher utilization of medical care. Negative attitudes on the job and higher rates of absenteeism have also been demonstrated in research.

**RECOMMENDATIONS**

Injured workers who suffer chronic pain represent a unique medical population. MDT’s are designed to meet the complex treatment challenges posed by this patient population. These teams function most effectively as an integrated unit with open communications, common goals, and a unified, synchronized treatment plan. They must have the ability to bring to bear their various disciplines with the appropriate timing and to the indicated extent required by each unique case.

Psychology services may be identified to be the first level of required treatment. Depressed, sleep deprived patients are unlikely to respond maximally to physical therapy, procedural interventions, or pain medications alone. Team members from the various disciplines must work together with patients’ primary treatment goals in mind. A psychological evaluation with testing and counseling sessions is an effective investment in cost containment.

Psychology services are targeted at functional restoration, enabling patients to return to work. The psychologically restored worker is at reduced risk for additional injuries in the work environment. The restored worker can be expected to have a more positive attitude towards the employer and less absenteeism than workers not similarly restored.

Although this article primarily refers to patients who have not fully recovered from injury after three months, much of the data has universal applicability in medical treatment.

**ADDENDUM A**

a. Although news reports linked the Exxon Valdez tragedy to the captain’s alcohol problem, the captain was off the bridge well before the accident. “The direct cause of the accident was the third mate who had slept only 6 hours in the previous 48 and was severely sleep deprived.”

“As the Exxon Valdez passed Busby Island, the third mate ordered the helm starboard, but didn’t notice that the autopilot was still on and the ship did not turn. Instead it plowed farther out of the channel. Twice lookouts warned the third mate about the position of lights marking the reef, but he didn’t change or check his previous orders. His brain
was not interpreting the danger in what they said. Finally, he noticed that he was far outside the channel, turned off the autopilot, and tried hard to get the great ship pointed back to safety - too late.” 1

b. A more dramatic tragedy was the explosion of the space shuttle Challenger: “Not well known at all is the fact that the Human Factors Subcommittee attributed the error to the severe sleep deprivation of the NASA managers.” This conclusion was only in the committee’s final report and related to a launch decision in the absence of data on O-ring function at low temperatures. 1 Similar problems have been attribute to the tragedies of Three Mile Island and Chernobyl. At Chernobyl, the engineers clearly noticed critical warnings that should have caused panic but they did not respond.

c. In 1990 the national Transportation and Safety Board recognized that fatigue is the most frequent, direct cause of truck accidents in which the driver is killed. A study of 602 drivers were interviewed and overnight sleep recordings were gathered on 200. Eighty-two percent of the drivers state they would stop driving when they had a startle resulting from a head drop, or when they saw something on the road that wasn’t there (a hynagogic hallucination).

Both of these events indicate the driver had already fallen asleep at the wheel. Of the same group, over 70 percent were diagnosed with sleep apnea, 13 percent at severe levels.

A study of 6,000 patients with sleep apnea found that 15.6 percent had had at least one car accident compared with 6.7 percent for the non-apnea control group. The combination of apnea with alcohol use (2 or more drinks per day) resulted in a fivefold increase in sleep-related accidents compared to healthy drivers with minimal to moderate alcohol use.

d. WV Workers’ Compensation Division HCAP: Outpatient Management of Chronic Pain, 10/19/96.

REFERENCES
1 WV Workers’ Compensation Division HCAP: Outpatient Management of Chronic Pain, 10/19/96.
2 “Mental Medicine Update” (Volume IV, Number 4, 1996).
5 “Insomnia: Assessment and Management in Primary Care” (SLEEP, Vol. 22, Supplement 2, 1999).
6 The Promise of Sleep, William C. Dement, M.D., Ph.D.
Federal rules of evidence that govern expert scientific testimony have been extensively discussed in the legal literature. This article aims to discuss these rules, and the history of these rules, in a way that may help physicians and scientists understand the process of such testimony.

**History of the rules that govern expert scientific testimony**

**The “Frye Test” and Rule 702 of the Federal Rules of Evidence:**

In 1923, in *Frye v. United States,* the court developed a standard known as the Frye test. Under the Frye test, a scientific opinion based on a scientific procedure or technique was inadmissible as evidence unless the procedure or technique had gained “general acceptance” in the scientific community. Before 1993, what came to determine this “general acceptance” was whether or not the testimony was based on information that had been published in peer-reviewed journals. Thus, the Frye test required that the foundation of experts’ opinions be published in a peer-reviewed journal.

Fifty years after the Frye test was developed, Rule 702 of the Federal Rules of Evidence was adopted. This Rule stated: “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.” It further stated that the subject of an expert’s testimony must be “scientific ... knowledge.”

**The all-important Daubert decision:**

After the adoption of Rule 702 of the Federal Rules of Evidence, two independent tests governed the admissibility of scientific opinion evidence – the Frye test and the test established by Rule 702 of the Federal Rules of Evidence.

With the above two entities both in place, in 1993 a landmark case was brought before the United States Supreme Court. This was *Daubert v. Merrell Dow Pharmaceuticals, Inc.*

Daubert was a minor child born with serious birth defects. This plaintiff alleged that the birth defects were caused by his mother’s ingestion of Bendectin for morning sickness during pregnancy. The defendant moved for summary judgment based on their expert’s review of published studies showing that Bendectin does not cause birth defects, and further based on their claim that the plaintiff would be unable to introduce any admissible evidence to the contrary. This second basis for the motion applied the Frye test, saying that plaintiff’s experts’ conclusions had not been published and would therefore not be admissible as evidence.

The plaintiff’s experts based their opinions on their unpublished research and re-evaluation of existing studies.

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1Under the law a jury is employed to resolve factual disputes between parties, that is, to determine what evidence to believe when there is a conflict over what occurred prior to the bringing of the case. When there is no conflict over the facts, the law holds that a judge may rule on the case without a jury. In such a situation, the court enters what is called a summary judgment.
Their research consisted of test tube and animal studies, and pharmacological studies of the chemical structure of Bendectin that showed similarities between its structure and that of known teratogens. Plaintiff’s attorneys argued that Rule 702 of the Federal Rules of Evidence superseded the Frye test.

The U.S. Supreme Court sided with the plaintiff, and thus established Daubert as an important precedent. The court stated that nothing in Rule 702 of the Federal Rules of Evidence established “‘general acceptance’ as an absolute prerequisite to admissibility,” and that the rigid Frye test was at odds with the “liberal thrust” of Rule 702 of the Federal Rules of Evidence “relaxing the traditional barriers to ‘opinion’ testimony.” The court established that the rigid Frye test should not be applied in federal trials.

The court went on to explain what did constitute admissible scientific testimony. The court placed its emphasis not on conclusions or publication, but on “scientific knowledge” and relevance. The court further defined “scientific knowledge” as being testimony that is based on valid methodology which can be applied to the matter at hand. The court placed the emphasis on methodology and not conclusion.

The court did not disparage the value of peer review and publication. In fact, it stated that whether or not the methodology used had been subject to peer review was one aspect of consideration regarding the admissibility of evidence, but not the only aspect. Further, it stated that “Publication ... is not a sine qua non of admissibility.”

The court addressed one concern of the defendant by saying, “Respondent expresses apprehension that abandonment of ‘general acceptance’ as the exclusive requirement for admission will result in a ‘free for all’ in which befuddled juries are confounded by absurd and irrational pseudoscientific assertion. In this regard respondent seems to us to be overly pessimistic about the capabilities of the jury and of the adversary system generally. Vigorous cross examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence.”

One outcome that has resulted from the “liberal thrust” of Rule 702 of the Federal Rules of Evidence and Daubert is removal of potential bias. Science is just as subject to bias as any other discipline. For instance, research is funded by private interest groups. Also, bias could potentially affect the publication of certain material controversial for certain interest groups. Though Daubert does not endorse the use of “pseudo science” or “junk science,” meaning testimony that has no basis in science, it allows for all valid science – no matter how popular or unpopular, no matter how controversial or how in keeping it is with the interests of any one particular group – to be considered.

**LEGAL AFTERMATH OF RELAXING THE STANDARD FOR EXPERT SCIENTIFIC TESTIMONY:**

Daubert placed the judge in the role of gatekeeper for testimony. It gives the judge guidelines by which to analyze the admissibility of scientific testimony. The guidelines for admissibility according to Daubert are not whether or not an expert’s particular conclusion is controversial or in accordance with other testimony, or whether or not that conclusion has made its way into a peer-reviewed journal, but whether or not the claims being made by the expert are based on scientific methodology as opposed to “subjective belief or unsupported speculation.”

**DAUBERT UPHOT FOR MEDICAL DOCTORS:**

While Daubert addressed laboratory science results and methodology on a large scale, high profile case, it extends as well to scientific, expert testimony of any scale. One example of this would be testimony regarding a particular patient, wherein that testimony is based
on scientifically recognized physical exam findings, for instance range of motion measurements and/or laboratory results.

Daubert states, “Unlike an ordinary witness, . . . an expert is permitted wide latitude to offer opinions, including those that are not based on first hand knowledge or observation.... Presumably, this relaxation of the usual requirement of first hand knowledge ... is premised on an assumption that the expert’s opinion will have a reliable basis in the knowledge and experience of his discipline.”

Thus, under Daubert, medical doctors as experts are to be given latitude in their conclusions and testimony. It is up to the presiding judge to fulfill his/her designated function as gatekeeper only for the admissibility of their testimony using the standard of basis in “scientific ... knowledge.” What conclusions are reached has no bearing on the admissibility of the testimony.

**BEYOND THE GATE: WHAT MAKES TESTIMONY SUCCESSFUL?**

Once beyond the gate, that is to say, once testimony is ruled admissible by the presiding judge, then there are innumerable factors which may affect jurors. From an individual perspective, it would be hollow to say what affects jurors and what type of testimony bears more weight. According to a study by Shuman, et al, the two most important factors in the believability of an expert witness are the ability to convey information in laymen’s terms (36%) and a willingness to reach firm conclusions (31%).

**Summary:**

This article tries to put in plain words the gist of the historical Daubert decision not for the legal community, but for the all-important expert witness. Words such as “peer-reviewed” and “junk-science” are often mentioned in the expert witness atmosphere, but this article attempts to further explain the what and the why of these terms, and to put them into perspective.

In summary, for judges as gatekeepers, Daubert addresses disparity between the Frye test and Rule 702 of the Federal Rules of Evidence, and it shifts weight of admissibility from publication to “scientific ... knowledge.” The “liberal thrust” of Rule 702 of the Federal Rules of Evidence, and as such, of Daubert, and the “wide latitude” given expert witnesses under Daubert, places deliberation of the weight of matters concerning scientific testimony for debate in the open court.

**References:**


**CME QUESTIONS:**

1. The Daubert decision:
   a. Allows for all testimony by a scientist or physician to be considered.
   b. Shifts the weight of admissibility over to credentials of expert, instead of subject matter and conclusions.
   d. Shifts the weight of admissibility from the Frye test to methodology and basis in scientific knowledge.

2. “Pseudo-science” or “junk science”:
   a. Is science that is experimental.
   b. Is not proven by scientific methodology.
   c. Is an article that is pending publication.
   d. Was admissible before Daubert.

3. What are the two factors most important in believability of expert witnesses?
   a. Use of laymen’s language and basis in scientific knowledge.
   b. Appearance and firmness in conclusions.
   c. Firmness in conclusion and use of scientific methodology.
   d. Use of laymen’s language and firmness in conclusions.

The answers will appear in the next issue.
INTRODUCTION

In 1991 the American Medical Association (AMA) requested an Injury model from the first author for the spine section of the 4th edition of the AMA Guides to the Evaluation of Impairment. Their query was based upon the group’s concerns about the objectivity and reproducibility using spinal range of motion to rating impairment in the 3rd Edition. An injury model portends more defensible basis for decision making about impairment than either range of motion or imaging based models. Additionally, an injury model can remove any potential settlement penalty for a patient who responds either well to treatment or earnestly to an examiner’s requests to bend. Moreover early impairment decisions become possible based upon the “presence” of objective medical findings (Differentiators) for determining Diagnosis-Related Estimates (DRE) of impairment in the majority of cases. “Residuals” of severe neurologic insult determine the impairment rating in those rarer cases. Meeting such goals requires the simplicity of a clinically based system.

HOW TO MAKE AN INJURY MODEL FOR THE SPINE

Pirates of old awarded an individual for loss of an eye or segment of an extremity. Pirates did not wait to see how the loss of a finger affected the individual. The pirate’s award for bravery in battle was based upon loss of a component according to objective findings of segmental loss that implied but not intended to measure loss of function, e.g., first, second or third segment of a finger to imply level of lost function. In essence, the pirates wanted objective determinants to avoid haggling that also met their perceptions of expected impact upon function.

Everyday we predicate our recommendations to our patients according to their clinical findings. We could rarely recommend anything if based upon the number of lost vertebrae or disks. Vertebral loss requires unusual severe trauma. Disk damage is clouded severely by normal aging changes. We address our concerns differently according to different clinical findings. If we begin by defining “normal” back as the young limitless spine (DRE I), we then address our patient’s findings according to our perceptions of impact on their ability to function. If we find no neurological or structural compromise, our suggestions are more reassuring than if we find radiculopathy. If we find a loss of structural integrity without neurological involvement we tend to be less aggressive than if there is fear of neurological compromise. We do not use anatomic segment as did the pirates, but similarly we use our clinically impressions to naturally segment different levels of expected spine activity tolerance. Thus, loss of the young back (DRE II) without neurologic compromise or loss of structural integrity can be compared to a Pirate’s fingertip injury. Radiculopathy (DRE III) seems to worsen the usual expected activity tolerance perhaps similar to losing part of the distal phalanx rather than just a fingertip. Lost structural integrity (DRE IV) may compare to losing the whole distal segments of a
finger and both neurological and structural compromise (DRE V) parallels loss of part of the finger’s middle phalanx. Using a Spine Injury Model the expected impact on activity tolerance is predicated on clinical findings. The DREs provide a similar objective parallel to the objective loss of a limb segment in the pirate model. Rather than anatomic segments as in the finger, spinal DRE I, II, III etc., are the hypothetical segment (represented in Table 1). The DRE segments are derived similar to how we practice medicine. Examination and study findings alter our recommendations to our patients. We grade our suggestions according to the potential impact the clinical finding may have on our patient’s spine.

Once using a Spine Injury Model as DRE I, II etc., we find other similarities to centuries old pirate system. We cannot lose the same segment more than once more than a pirate could lose the same phalanx more than once. Despite phantom pain or bumping the stump or even suffering another wound to the stump care may be provided but no further award was allowed unless the next segment was lost. Similarly another incident or recurrence of symptoms or even a similar wound like herniation or fracture at a different motion segment without meeting criteria for the next DRE level in a Spine Injury Model is not loss of another segment of expected activity tolerance.

For an example, sciatica from lumbar disk herniation suggests a DRE III level of impairment. A recurrence, at the same or different lumbar level with or without discectomy for objective radiculopathy due to herniation, would not constitute another loss of this same DRE again. That DRE III tolerance was already lost in first herniation! The individual would be eligible for care and treatment but the DRE would increase only by meeting criteria for DRE IV-VIII. As the pirates, could not lose the same phalanx of a digit twice, any further award required losing the next digit. Considering the DREs as segmental loss relative to a normal young spine tolerance may justify sciatica from disc herniation or stenosis (a normal part of life, relating predominately to genetics and aging) to be covered as an injury for insurance company purposes.

The Spine Injury Model uses clinically available Differentiators to determine DRE level of pathology. Thus, the level of impairment can be determined more quickly for the vast majority of spine claims. The DRE are based upon clinical care diagnostic techniques as Presence DRE criteria. No longer will an individual fear responding too well to treatment or examination requests as jeopardizing his or her settlement in the vast majority of cases DRE I-IV. Yet, where it is important for the rare severe insults (cauda equina-like deficits) the rating awaits maximum improvement as Residual DRE criteria (for Presence & Residual see Table 4: common categories Part II).

We also intended the Spine Injury Model to clarify the physician’s role. The clinician is a logical translator of the history, physical exam and special study findings into a report that allows the jurisdiction to determine cause and effect and level of impairment. We delineated decision making using Differentiators with objective and reliable data above DRE II: Is there evidence of damage (clearer diagnostic interpretations)? This should allow the clinician more time to consider to what cause (injury or insult) should the damage be related (Bradford Hill

### Table 1: Lumbar DRE

<table>
<thead>
<tr>
<th>Lumbar Spine Impairment Diagnosis Related Estimate (DRE)</th>
<th>% Total Body Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRE I Complaints</td>
<td>0</td>
</tr>
<tr>
<td>DRE II Clinical Signs</td>
<td>5</td>
</tr>
<tr>
<td>DRE III Radiculopathy</td>
<td>10</td>
</tr>
<tr>
<td>DRE IV Loss of Seg. Integrity</td>
<td>20</td>
</tr>
<tr>
<td>DRE V Both III &amp; IV</td>
<td>25</td>
</tr>
<tr>
<td>DRE VI Caud. Eq. Bowl &amp; Bladder OK</td>
<td>40</td>
</tr>
<tr>
<td>DRE VII Caud. Eq. Bowl &amp; Bladder Impaired</td>
<td>60</td>
</tr>
<tr>
<td>DRE VIII Paraplegia</td>
<td>75</td>
</tr>
</tbody>
</table>

Clinical signs = clinical signs of lumbar injury but no radiculopathy or instability. RADIC = evidence of radiculopathy. Loss of Seg. Integrity = instability by criteria (see Differentiator #5). Caud. Eq. Bowl/Bladder OK = Cauda Equina like paraparesis minus Bowl/Bladder impairment, Caud.Eq. Bowl/Bladder Impaired = Cauda Equina limb impairment with Bowl/Bladder impairment, Paraplegia = physiologically documentable paraplegia. (see Lumbo-Sacral DRE)
What reliable data supports your opinion?

**DIFFERENT VERSIONS OF AMA GUIDES: GUIDELINES NOT RULES**

It is important to differentiate between a guideline and a rule. This difference is well depicted in the movie Ghostbusters where Bill Murray’s character responds to seduction by Sigourney Weaver’s, “As a rule I don’t sleep with people who are possessed.” But as she continues her amorous advances he adds, “That’s more a guideline than a rule.” Similarly the AMA Guides to impairment is, as titled, a guide and not a rule. Guidelines are intended to help, not limit, a clinician’s professional contribution of some reliable science to arbitrary administrative codes.

In 2001, the importance of differentiating guidelines from rules comes to the forefront in the arena of workers compensation. The US Supreme Court advises judges since the 1993 Daubert vs. Merrell Dow decision, to concentrate on the data behind the expert’s opinion rather than relying on subjective experience. These rules of evidence require judges to allow only opinions supported by scientific evidence beyond hypothesis. The US Supreme Court’s 1993 change in the Federal Rules of Evidence (F.R.E) is redefining the playing field even for workers compensation. F.R.E. explicitly demanded peer-reviewed published data that results from research based upon accepted scientific methods that must include both hypothesis testing and an error rate. F.R.E. further require the data be formulated independent of the proceedings for which it is presented. Since 1993, what is known as the Daubert Decision has been upheld and strengthened by General Electric vs. Joiner, Kuhmo Tire vs. Carmichael and Weisgram vs. Marley cases at the US Supreme Court level and in district court of appeals with decisions like the Black vs. Food Lion as it applies to medical testimony. The new F.R.E. gradually creeps into the different corners of our legal institutions with decisions on record in Arkansas and Tennessee workers compensation cases in 2001.

Thus evidence based on hypothesis testing could soon supersede whatever administrative guidelines we now use. Daubert F.R.E. will obviously challenge the foundation of current medical and legal practices of the many jurisdictions. Clinicians soon may have to defend the scientific basis behind opinions. The Spine Injury Model thus provides a firmer scientific basis to administrate expert opinions than either range of motion or imaging models of impairment rating.

Always remember that the court requests your opinion. As professionals our opinion for patients is hopefully based upon more scientifically sound foundation than can be obtained from his or her grandmother. Judges are beginning to demand we scientifically justify our opinion. We will no longer be able to hide behind the books we use for guidance. In some instances we may be forced to vary significantly from undefendable guides too weakly based science. To be fair, professional and acceptable as an expert, clinician will need to use evidence based on a firmer scientific foundation.

**BACKGROUND INFORMATION**

Impairment rating is complicated as percentages may or may not have anything to do with specific measurements. Moreover, questions arise as to whether awards should be related to incident or loss. Should one receive an award for each insult (each concussion playing football) or according to the result of recurring headaches and more easily concussed with less insult? In impairment systems, the measured loss rather than the occurrence is the issue.

With the spine we have the added problems of categorizing anything short of fracture or dislocation. Strict application of either the Bradford Hill Criteria of Causality or similar 1979 NIOSH Guide to Work Relatedness of Disease would not justify our use of the term injury in the vast majority of spine claims. Thus, meaningful clinical tools
used to differentiate the DRE levels help to objectify a Spine Injury Model. Common clinical Differentiators can offer objective and relevant insult criteria. These Differentiators can relate injury or disease to loss of function with the efficiency of the old pirate model. Following are some considerations concerning reality about frequency of complaints, anatomic aging that makes imaging studies confusing and the issues of spinal motion measurements.

Spine complaints with related activity tolerance loss are an unavoidable part of life without significantly incited by accident(s) or unusual activity. Many people at age 30, most by age 40, and virtually everyone by 50 years of age are limited whether or not they experience incidents at work or in their car. A 50 year old spine rarely tolerates rigorous activity as expected at age 18 years.

Anatomic aging changes come early and are unavoidable with increasing age expressed in patterns strongly related to genetics. Wear and tear relates poorly to prior activities short of incidents causing fracture or dislocation. Recorded X-ray, imaging studies and range of motion are weakly associated with the cause of spine symptoms by either Bradford Hill criteria or NIOSH Guide to Work Relatedness of Disease. Imaging study based impairment systems unjustifiably relate many spinal changes as proof of damage. They seem no easier to administrate and are easy targets for Federal Rules of Evidence attacks in court. Aging spine synonyms like Osteoarthritis (OA), Degenerative Joint Disease (DJD) or Degenerative Disk Disease (DDD) are commonly present in spinal X-rays and imaging studies in 40% of asymptomatic people by age 35 years. Spondylolysis (7%) and spondylololisthesis (3%) are common findings that develop before adulthood. Silent disc hernia (without radiculopathy symptoms) are seen in 30% of us by the end of the third decade. These are significant confounders for imaging study impairment systems.

Spinal structural changes are much more common with increased age than the hip, gleno-humeral joint or digits. For example only 5-7% of 70 year-old hips have degenerative radiographic changes. This may follow nutrition since the adult spinal discs are avascular. Spinal aging changes similar to hip degeneration is noticeably long before age 70 in the lower lumbar discs. These changes correlate poorly with spinal symptoms. The hip structural degenerative changes have a much higher correlation to specific complaints, physical findings and causality than those found in the spine.

Spinal aging changes fit poorly into a structurally oriented model of determining impairment sans evidence of fracture or dislocation. Investigations of the spinal aging changes of identical twins identify that genetics by far predominate in explaining MRI structural changes. Little seems to truly relate to activities or occupation without firm evidence of prior fracture or dislocation injuries.

The 3rd edition of the AMA Guides section on the evaluation of spinal Impairment centers around spinal range of motion measurements. This model is accused of being too complex, time consuming, requiring tools not common to medical care of back patients and a bias favoring older individuals and male gender. Spinal range of motion also relates to age with great individual variation. It becomes nearly impossible to draw a distinction between age related motion loss and that which is related to injury without fracture or dislocation. Lowery et al, found normal subjects to meet the criteria for 2.38% total body impairment according to their spinal range of motion measurements using the AMA Guide for Impairment 3rd Edition. This begs the question of a common logical query attributable to Nortin Hadler:

1. What are we measuring? 2. Why are we measuring it? Would anyone take a patients history then measure the range of motion alone to proffer
recommendations about expected activity tolerance? Of course not! Such an opinion comes after considering potential neurological and structural compromise. Moreover, the 3rd edition Range of Motion system may favor those who remained inactive, responds poorly to treatment or displays pain behavior. Waiting for the end result of motion loss or aging changes on radiographs tended to keep issues from being resolved in a timely fashion.

The original Spine Injury Model draft argued against considering spine problems an injury other than where there is proof of damage beyond aging (fracture or dislocation). This consideration was dismissed when American Academy of Orthopedic Surgeons and the American Medical Association representatives aligned the Spine Injury Model with the rest of the AMA Impairment Guide. This alignment of the spine section also left numerous requests for clarity of the 4th Edition’s spine portion that centers around three issues.9

Queries about utilizing the 4th Edition concern three areas: 1. Loss of structural integrity X-ray method. 2. How to deal with pre-existing problems. 3. Adding Diagnosis-Related Estimates (DRE) VI-VIII to DRE I-V in non-Lumbar areas. The first will be dealt with in this paper. For the last two concerns, we will revert to the pre-alignment levels of Cauda Equina-like issues as in the original using Additional Long Tract Impairment A, B, C to be added to Non-Lumbar region DREs. These Cauda Equina-like additions parallel Lumbar DRE VI, VII & VIII.

In 1991 the AMA requested the Spine Injury Model. The charge was to create a simpler alternative to structure oriented or range of motion model of estimating impairment. The result was the Spine Injury Model in the 4th Edition of the AMA Guide using the Diagnosis Related Estimate (DRE) to evaluate impairment based upon clinically available Differentiators. The goal now is to help one scientifically justify ones opinion to qualify as evidence in the future. Before reviewing the DREs Let us first visit the Differentiators used for DRE determinations.

**DIFFERENTIATORS FOR LEVELS OF DRE**

The DRE or Spine Injury Model relies on clinical evidence of documentable neurological or structural compromise. As an example neurologic compromise is detectable on Electromyography (EMG) or Cystometrography (CMG). Structural compromise (fracture, dislocation or lost structural integrity) is detectable with specific X-ray and imaging studies. The model emphasizes detection of clinical findings not common to more than 50% of people before retirement age.

Different levels of impairment, are labeled Diagnosis-Related Estimates (DREs I-VIII) in the LUMBAR spine. In the CERVICAL and THORACIC areas, DRE I-V include the potential for ADDITIONAL LONG TRACT IMPAIRMENT ESTIMATES (Long Tract A, B, C, similar to DRE VI-VIII in the lumbar spine) that can be added to DRE I-V above the lumbar region. All DRE levels are distinguished by commonly available evaluation tools as discussed below.

If the difference between DRE levels seem unclear, a series of clinical Differentiators (see Table 2) offer the examiner easily available objectifiers of physiologic or structural impairment uncommonly related to aging or found in asymptomatic individuals. Only the first Differentiators requires a non-objective judgment based upon the examiner’s impressions of severity. All others Differentiators correlate complaints to documentable physiologic or structural compromise such as in limbs (#2,3,4) or bowel and bladder neural deficits (#6,7) or loss of motion segment integrity (#5). The DREs also consider the less common but more serious types of structural compromise (fracture or dislocation).
Differentiators – Using the Spine Injury Model, the determinations of impairment relies upon identification of the following objective clinical findings as in the last six items in Table 1. For Lumbar DREs III-VIII in Lumbar spine or Cervical and Thoracic that includes Additional Long Tract Impairment (Long Tract-A,B,C) those Differentiators with asterisk(*) as in items #4,5 and 7 hold greater objectivity.

When information about Differentiators is deemed insufficient to remove reasonable doubt, defer to the lesser DRE. The basis for these categories relies upon the interpretation of:

1. **Muscle Guarding** (paravertebral) increases the clinician’s index of suspicion of possible fracture dislocation or infection. Paravertebral muscle guarding is non-specific and common in people for no known reason and resolves spontaneously. Muscle guarding is commonly termed “spasm”, despite studies finding the muscle EMG silent. These muscular findings are distinct from either muscle cramps and neurologic spasms noted in spinal cord injuries or some myopathies. Guarding is included as a Differentiator to allow the clinician leeway to relate an incident or external force as the cause or to point to a loss of young spine tolerance. The clinician can use historical, assumed or observed evidence of paravertebral muscle guarding as justification for DRE II rating. Often the opinion may depend on the perceived relationship between the incitation and loss of the young spine tolerance. Here muscle guarding is synonymous with acute period non-uniform loss of range-of-motion, and dysmetria as a clinical reminder for justifying a loss of young back tolerance with no radicular complaints.

2. Related focal loss of deep tendon reflexes in the upper and lower extremities due to radiculopathy (verifiable by #4).

3. **Related Atrophy** as circumferential loss of girth greater than 2cm measured above or below the knee or elbow that cannot be explained by non-spine problems or hypertrophy - e.g., as dominant limb, unilateral hyper- or hypo-activity (verifiable as related by #4).

4. *Unequivocal Electromyographic (EMG) findings of nerve root compromise in the extremities. Including documentable findings in the acute period with multiple positive sharp waves and fibrillation potentials, with or without slowed H-wave or if studied late, appropriate polyphasic waves more accountable to the incident in question than other insults.

5.* Loss of structural integrity of a spinal motion segment documented with comparison of Lateral hyperflexion/hyper-extension x-rays views exhibiting significant injury related translation or angular motion (see Overview of hyper-flexion, -extension concepts). The relative position of adjacent vertebral bodies on lateral hyperflexion radiograph, relative to the hyper-extension radiograph (See Figures 6 & 7 X-ray A & B) are measured to evaluate segmental motion or translation. Significant anterior to posterior translation is >3.5 mm in the cervical region, or >5 mm of levels in the thoracic and lumbar regions. Significant rotatory motion is >11 degrees more motion than at adjacent motion segments except or at L5-S1 where more than 15 degrees angular motion is required. Evaluating translation and rotatory motion rather than displacement (fixed spondylolisthesis) alone is important in evaluating potential spinal instability other than for acute fracture or acute dislocation.

**Table 2: Differentiators**

<table>
<thead>
<tr>
<th>AMA Impairment Guide Differentiators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Guarding (DRE II)</td>
</tr>
<tr>
<td>2. Loss of Reflexes (DRE III, V-VII)</td>
</tr>
<tr>
<td>3. Atrophy - Measured Circumferentially (DRE III, V-VII)</td>
</tr>
<tr>
<td>4. *Electrodiagnostic Evidence (DRE IV-V)</td>
</tr>
<tr>
<td>5. *Structural Integrity Deficit (DRE IV-V)</td>
</tr>
<tr>
<td>6. Loss of Bowel/Bladder (DRE VII-VIII or LT A-C)</td>
</tr>
<tr>
<td>7. *Bladder Studies (DRE VII-VIII or LT A-C)</td>
</tr>
</tbody>
</table>

* = Greater Objectivity
6. **Rectal Tone** examination indicating loss of elimination control due to spinal injury.

7. **Cystometrogram** (CMG) studies indicative of unequivocal neurologic motor and/or sensory compromise with incontinence or retention related to spinal injury.

Differentiating between DRE I-II is left to the clinical judgment of the physician to consider severity of incitement causing loss of young spine justified by observation or presumption of guarding alone. Beyond DRE II clinicians can rely upon more objective Differentiators described above.

**BASIS FOR IMPAIRMENT RATING USING THE SPINE INJURY MODEL**

Eight DRE levels exist for the Lumbar Spine and Five for both the Thoracic and Cervical Spine where three levels of Long Tract Additions can be combined for lower extremity compromise similar to Lumbar DREs VI-VIII levels of Cauda Equina. In essence, all have eight somewhat parallel levels of loss of young back tolerance. Non-injury related spine complaints, considered an unavoidable part of life, equate to DRE I (0%) of Permanent Partial Impairment. DRE VIII is paraplegia or the cauda equina-like expression (though it may be spastic) from spinal cord involvement in either Thoracic or Cervical spine to be combined with those levels of impairment rating to the rating from any compromise specific to the Thoracic or Cervical region. DRE II relies upon clinical history and indications of mild to moderate, minor impaired function that relates to external force from an incitement justified by history compatible with muscle guarding. DREs III-V, DREs VI-VIII and the potential Long Tract Impairment additions above the Lumbar region, all demand documentable evidence of insult that does not occur in 50% of people by retirement age. These include verifiable radiculopathy, lost motion segment integrity as measure of instability, multi-level neurologic compromise or structural compromise and severe neurologic compromise with partial or complete cauda equina-like dysfunction.

In obvious cases, such as localized severe radicular findings, physicians usually agree on a DRE III level of impairment soon after incitement. But it can be more difficult to reach consensus when clinical findings were never so obvious or after the acute symptoms have passed. This is the reason for more objective Differentiators (#4,5,7) for differentiating Categories II-VIII.

Note also DRE VI-VIII for cauda equina issues (similar to Additional Long Tract cord involvement in non-Lumbar regions) that impairment rating is based upon the “residual” determinates. Before reviewing the lumbar impairment criteria quickly review the Table 4: Common Categories. This table not only gives an organizational overview but introduce the relationship between the “presence” determinations for the most common categories and “residual” determination used for the more serious determinations.

Finally in this paper we will discuss some issues in the clinicians approach to gathering information.

**LUMBAR SPINE DIAGNOSIS RELATED ESTIMATES (LUMBAR DRE) IMPAIRMENT**

<table>
<thead>
<tr>
<th>Lumbosacral DRE I: Complaints and Symptoms</th>
<th>Structural Inclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complaints</td>
<td>None</td>
</tr>
<tr>
<td>No History of significant injury</td>
<td>No Objective findings</td>
</tr>
</tbody>
</table>

0% Impairment

No significant clinical findings, e.g. no logical specific related incident and/or
expected muscular guarding related to potentially injurious incident, and no documentable neurologic impairment or significant instability on lateral hyper-flexion, hyper-extension radiographs.

**STRUCTURAL INCLUSIONS for DRE I**

\[ \text{None} \]

(See Differentiator #1)

Clinical history of a specific incident and/or clinical findings compatible with incitement with expected findings of significant muscle guarding (intermittent or continuous) that could be observed by a physician BUT NO EVIDENCE of related objective signs of radiculopathy as defined in DRE III or instability as defined in DRE IV.

**STRUCTURAL INCLUSIONS for DRE II:**

1. 25% compression of one vertebral body.
2. Posterior element fracture without dislocation (but not just developmental spondylolysis) that heals without instability or radiculopathy. Spinous process or transverse process fracture alone with displacement qualifies for DRE II as it does not disrupt the canal.

<table>
<thead>
<tr>
<th>Lumbosacral DRE II: Minor Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differentiators</strong></td>
</tr>
<tr>
<td>History of Significant Injury</td>
</tr>
<tr>
<td>Muscle Guarding</td>
</tr>
<tr>
<td>No Objective Radiculopathy</td>
</tr>
<tr>
<td><strong>Structural Inclusions</strong></td>
</tr>
<tr>
<td>Compressive Fracture &lt; 25%</td>
</tr>
<tr>
<td>Non-displaced posterior element fracture</td>
</tr>
<tr>
<td><strong>10% Impairment</strong></td>
</tr>
</tbody>
</table>

(See Differentiator #2, 3, and 4)

Evidence of significant radiculopathy can be met two ways: 1.) Loss of reflex, previous measured atrophy of greater than 2cm decrease in circumferential measurement above or below the knee that relates to back symptoms not explainable by other lower extremity problem. 2.) verifiable electromyography of multiple positive sharp waves, fibrillation potentials or slowing (e.g., H-reflex) acutely or verifiable later with appropriate equivalent polyphasic changes) concordant with an anatomic defect on imaging studies on the same side and corresponding expected level indicating nerve root entrapment. Criteria should be present prior to any operation and operation is not required to be Lumbar DRE III, otherwise DRE II (additional DRE post operation would relate to treatment).

**STRUCTURAL INCLUSIONS for DRE III:**

1. 25-50% compression of one vertebral body
2. Posterior element fracture with dislocation disrupting the canal (not transverse or spinous process) perhaps including radiculopathy but structurally healing without loss of structural integrity. If fractured with dislocation, isthmic lesion should not be considered unless pre-incitement films not show no isthmic spondylolthesis or there is rapid 25-30% progression of slip within less than 6 months of the trauma or in presence of a very hot bone scan of obvious acute changes at the isthmic edges.

<table>
<thead>
<tr>
<th>Lumbosacral DRE III: Radiculopathy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differentiators</strong></td>
</tr>
<tr>
<td>Sciatica</td>
</tr>
<tr>
<td>Loss of Reflex</td>
</tr>
<tr>
<td>EMG verifiable Radiculopathy</td>
</tr>
<tr>
<td><strong>Structural Inclusions</strong></td>
</tr>
<tr>
<td>Compression Fracture 25-50%</td>
</tr>
<tr>
<td>Displaced posterior element fracture</td>
</tr>
<tr>
<td><strong>10% Impairment</strong></td>
</tr>
</tbody>
</table>

Verification - Defined Instability (See Differentiator #5)

Indications of significant instability as demonstrated greater than 5mm of translation anterior to posterior or, 11 degrees more angular motion at one motion segment as seen on comparable hyper-flexion/hyperextension lateral views (more than 15 degrees more angular motion at L5-S1) with clinically appropriate symptoms. Sciatica as defined in DRE III may not be involved (consider DRE V). Neurologic
decompression or fusion need not be carried out. If criteria not met in the pre-operative period, then DRE II with additions due to subsequent fusion.

**STRUCTURAL INCLUSIONS for DRE IV**

1. >50% healed compression of one vertebral body without residual neural compromise.

2. Multi-level motion segment structural compromise, e.g. fracture/dislocation beyond compression fracture (some administrative systems may be required such considerations in rating for pre-existing results of surgical ankylosis, prior decompression/stabilization) without residual neurological motor compromise.

**Lumbosacral DRE V: Radiculopathy & Lost Structural Integrity**

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Structural Inclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of sensation with motion</td>
<td>Multifocal aplex segment structural compromise</td>
</tr>
<tr>
<td>10” more than adjacent motion or 15” &gt; 1 L.1-5, L4-5</td>
<td></td>
</tr>
<tr>
<td>Statics</td>
<td></td>
</tr>
<tr>
<td>Loss of reflex</td>
<td></td>
</tr>
<tr>
<td>EMG verifiable Radiculopathy</td>
<td></td>
</tr>
</tbody>
</table>

Verifiable EMG + Defined Instability (See Differentiator #4,5)

The presence of significant, objective, impairment of the lower extremities based on circumferential measurements, reflex loss, and/or Electromyography findings of timely acute changes (multiple positive sharp waves, fibrillation potentials) combined with loss of structural integrity as defined in DRE IV whether neurologic decompression or fusion is carried out.

If criteria not met, then according to criteria met DRE II, III, or IV.

**STRUCTURAL INCLUSIONS for DRE V:**

1. Structural compromise with residual neural motor compromise but not cauda equina (DRE VI).

General Verifiable EMG (See Differentiator #4,6,7)

Residual Cauda Equina-like syndrome of objective, permanent partial loss of bilateral lower extremity or severe unilateral lower extremity function requires external ambulation devices (without related objectified bowel or bladder impairment), with or without instability. If not verifiable to substantiate permanent need for external devises, consider DRE III, IV, or V.

**Lumbosacral DRE VI: NONE**

(Structural compromise or instability (Differentiator #5) no added TBI)

**Lumbosacral DRE VII: Cauda Equina & Bowel & Bladder Signs**

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Structural Inclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent objective loss of bilateral limb function</td>
<td>None</td>
</tr>
<tr>
<td>Documentable Bowel/Bladder Impairment (CMG)</td>
<td></td>
</tr>
</tbody>
</table>

Verifiable EMG (general)+ CMG (See Differentiator #4,6,7)

Residual Cauda Equina-like syndrome as defined in DRE VI with permanent bowel and bladder involvement requiring external devises objectified by electromyography or cystometrograms as related to spinal compression. If EMG verifiable unilateral or bilateral leg involvement requires external devises, but unequivocally CMG relates to clinical bowel and bladder compromise then DRE VII. If no bowel or bladder symptoms, but CMG negative or findings relate more likely to another cause not related to spinal compression, then DRE III, V, or VI.

**STRUCTURAL INCLUSIONS for DRE VII: NONE**

(Structural compromise or instability (Differentiator #5) no added TBI)

**Lumbosacral DRE VIII: Paraplegia**

<table>
<thead>
<tr>
<th>Differentiators</th>
<th>Structural Inclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentable Total Loss walking and Bowel/Bladder Impairment (CMG)</td>
<td></td>
</tr>
</tbody>
</table>

General Verifiable EMG, CMG (see Differentiator #4,6,7).

Residual Paraplegia related to the lumbar spine, neural compression.

**STRUCTURAL INCLUSIONS for DRE VIII: NONE**
(Structural compromise or instability (Differentiator #5) no added TBI)

These lumbar spine categories are intended to be definable by almost any physician. In tables of the common Lumbar Spine DREs, the DREs to consider are listed for some common clinical presentations. The above percent impairment rating DREs are recommended in OPTION D (percent options) which in most cases correlates well to the other AMA system. Different systems may choose different percent options (below or arbitrarily created) to best meet their needs and allows them to allot reimbursements according to their previously legislated intentions for considering spine problems an injury. This method is offered as a simpler, more reproducible method for systems or physicians seeking an alternative.

THE PHYSICIAN’S ROLE IN SPINE IMPAIRMENT RATING

Recording medical impairment is part of the disability problem facing the physician, patient and insurance systems. The physician is commonly asked for opinion as to how much of the impairment is related to an incitement (causative event or factors) contributing to the medical issues at hand versus aging, prior illnesses or injuries. Unless the clinician observes the incitement, we must rely most heavily upon the patient’s description and physical findings. Thus, recording a good history from the patient, performing a physical examination and a review of prior objective medical studies are important before speculating in areas other than impairment. Physicians are commonly asked for predictions about future treatment and activity limitations. In such instances, final activity recommendations are best based on the patient’s present perceptions rather than incomplete or second hand historical information provided by either side of the adversarial insurance system. Then the clinician can stay within the role of recorder of information and does not have to accept unknowingly the legal system’s burden of determining what is truth.

Clinicians are often asked to speculate about prior problems and provide opinions beyond medical expertise, such as issues relating to future employment issues, fault and speculation about the reason for inconsistencies. An individual’s response to spine symptoms may vary greatly depending upon the patient’s predicament. A patient’s responses in an adversarial process are commonly related to other pressures including job requirements or a need someone else to be responsible for back limitations. The clinician should from questioning neither the integrity nor vision of the patient based solely upon recorded perceptions of other parties. Thus, all records should be approached with great caution. Record all inconsistencies but leave speculation to other professionals in the adversarial system. Rarely does our conjecture about the source of inconsistencies fall within our sworn medical oath or trained expertise.

Table 3 DRE Directions

<table>
<thead>
<tr>
<th>Table 3: DRE Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRE - Directions</td>
</tr>
<tr>
<td>1. History - Problem, Limitations, Onset, Reason</td>
</tr>
<tr>
<td>2. Physical Examination - Neurologic or not?</td>
</tr>
<tr>
<td>4. Select Spine Region Cerv-Thor (C-T), Thor-Lumb (T-L), Lumbo-Sacral (L-S)?</td>
</tr>
<tr>
<td>5. Review Differentiators - I-V - guarding, Reflexes, Atrophy, EMG, Motion films, VI-VIII or Long Tract A-C - Bowel &amp; Bladder, CMG’s</td>
</tr>
<tr>
<td>6. Evaluate the Table of Categories</td>
</tr>
<tr>
<td>7. Consider pre-existing or age impacts and subtract appropriately if necessary</td>
</tr>
</tbody>
</table>

RECORDING THE SPINE HISTORY (TABLE 3)

The physician should record a pertinent medical history including the patient’s description of the problem (pain, numbness, weakness and where) and how it limits the patient at present relative to perceived activity requirements. The patient should be asked how this present problem started and its relationship to previous spine problems. The patient should then be
asked to state how symptoms progressed and what special studies/procedures have been performed (films should be reviewed directly if possible or reported as read by others). The patient’s understanding of reasons for the present evaluation should be sought as well as, expectations from future medical care. It is also helpful to record the patient’s perceived options for future employment and livelihood. Review of systems and past medical history may elucidate potential confounding factors or needed medical recommendations.

RECORDING THE SPINAL EXAMINATION

Many aspects of the physical examination are covered in other parts of the AMA Guide. The neurological examination is the most specific for spine problems. Guided by the history, emphasis is given to physical findings such as reflexes and circumferential measurements of atrophy, that are objective, whether positive or negative. All findings should be related to other potential reasons for the abnormal, e.g. previous knee or hip surgery, hypertrophy due to unilateral activity, baseball pitcher or high jumper, etc.

Non-objective findings requiring patient volition, verbal response or interpretation, should be clearly identified, but not confused with findings indicative of non-physical pressures on the patient (Waddell tests for symptom embellishment). Motor, sensory, general range of motion, sciatic tension examination as well as inconsistencies should be recorded in their relationship to an expected normal response. The examination should record non-objective data that relies upon the interpretation or response of the patient. A vascular examination, inspection and follow-up of pertinent general medical information from the history should be sufficient for the physician to make reasonable recommendations relative to the patient’s spine problem.

In general, inconsistencies, embellishments and what has been termed “inappropriate pain behavior” should not guide the impairment rating but may alter expected response to care or suggestions. Avoid questioning integrity when interpreting inconsistencies like the Waddell tests. Inappropriate pain behaviors tend to be learned in the more acute stages and seem more a barometer of feeling trapped in a contest that can seemingly have grave impacts upon the life of patients and their families. The patient’s expression about symptoms is commonly increased when threatened or sensing that the clinician may not necessarily have the patient’s best interests in mind. Both are common during an examination ordered by an insurance company. Guard against inflammatory accusations or use of terms like malingering that can only worsen the adversarial process.

EVALUATION OF SCIATIC TENSION SIGNS IN THE LOWER EXTREMITY

Sciatic tension signs are a common part of evaluating acute compression of nerve roots. In chronic nerve root compression in spinal stenosis, tension signs are less useful. Though different methods of evaluating sciatic tension have been recommended, variations of straight leg raising are the most common. Research indicates that maximum excursion of L5 or S1 nerve roots in the region of nerve root foramen is in the straight leg raising range of 40-70 degrees (Figure 1 Sciatic Tension Sign A). This range can vary with body position. It is most reliable when pain response to the procedure is in a dermatomal distribution. With time sciatica improves as the pattern of discomfort tends to migrate proximal and evoked at ever-higher ranges of leg raising. The best means of detecting anatomic findings on imaging studies is the crossed (opposite) straight leg raising causing increased sciatic discomfort in the symptomatic limb, not just the back. Other means of qualifying straight leg raising is to record the response with sitting knee extension (Figure 3 Indirect Sciatic Tension Signs), or supine with the leg raised near the point of complaint, then recording the response to dorsiflexion then plantar
flexion of the ankle and internal then external rotation (Figure 2 Sciatic Tension Sign B).

Figure: 1 Sciatic Tension Signs A

Lift straight limb slowly asking the patient, "Tell me if this bothers you and I will stop". Note the approximate degree of angle and where the symptoms are referred (below knee, above knee or back only).

Figure: 2 Sciatic Tension Signs B

While holding the limb at, or near, the painful angle, dorsiflex then plantarflex the ankle, externally and internally rotate the raised straight limb. Note which maneuvers increase pain.

Figure 3: Indirect Sciatic Tension Signs.

While examining the knee or the foot, sitting knee extension should elicit complaints or a fall back if sciatic tension signs are positive.

PART II

In Part II we will continue with the use of the Spine Injury Model in the Thoracic and Cervical regions including continuing with the clinician’s role with special studies and recommendations.

The physical examination is very similar in the Thoracic spine and parallels the Cervical spine. In Part II we will build upon our knowledge of Lumbar DRE VI-VIII as we discuss Long Tract Additions A, B, C, that are similar and are additions to the segmental compromise above the lower extremity and elimination functions. After discussing the DRE criteria for the regions above the Lumbar region, we will discuss the basis for recommendations and also try to bring out the different pre-existing and issues with case studies.

Overview of Hyper-flexion, -extension Lateral X-rays concept:

X-ray evaluation. White and Panjabi in Figure 5, as well as, Posner described both transitional motion (Figure 6 x-ray A) relative to increased motion (Figure 7 x-ray B) having a potential to put neurologic elements at risk.14,15,17 Both are measurable criteria for lost motion segment stability. Both are very generous considering many patients with these exceptional findings do not even have symptoms.7 Is it reasonable to further speculate about anatomic aging changes since most are unavoidable before retirement age, are commonly present without problems and seem to relate most to genetic expression.3,6,9

Loss of structural integrity relates to hyper-mobility that causes stress shielding of the adjacent motion segments. The concept is similar to trying to fatigue a paper clip by repeatedly bending it back and forth (see figure 4). Early, before there is loss of structural integrity, bending causes uniform arching of the clip until there is a weak point. More angulation occurs with each subsequent bend. There is then a measurable amount of stress shielding for segments adjacent to the weakest most mobile point.

Figure 4: Fatiguing a Wire: First stresses bends the wire uniformly

Stressed with no week spot

Equal

Strength

Until there is a weak spot (where it will eventually break) that takes all the stress, shielding any bending stress elsewhere.

Stressed with the weak spot shielding the other aspects of the wire

Weak Spot
The adjacent segments of the paper clip see little bending stress concentrating all the motion at the weakest point until the weak point eventually fails. Due to great variation among individuals, we cannot just measure the motion at only one segment. We must measure motion relative to adjacent segment(s) seeking a relative increase in motion at one segment that leads to stress shielding of adjacent levels as in the failing paper clip. This concept was identified in laboratory experiments based upon identifying a point where failure would follow more rapidly once there is sufficient laxity at one point to expose itself to further stresses by shielding relatively stiffer adjacent segments (Figure 7 & 8 X-ray B).

Figure 5 – Cervical Spine from White, Johnson, Panjabi, Southwick CORR, 1978

Criteria for fracture dislocation later applied to motion by Posner and clinically to instability by Boden and Wiesel.7

Figure 6: X-ray - Increased Motion Shielding Adjacent Angular Stress

Superimposing a vertebrae adjacent to the motion segment to be measured (here L4) from lateral films taken at the extremes of motion.

The endplates or posterior bodies can be used to measure the change in angular relationship from hyper-flexion to hyper-extension.

Stress shielding occurs when there is more than 11° of motion more than the adjacent segments. At L5-S1 more than 15° greater than L4-L5 segment.

Figure 7: X-ray B - Translation of Instability

Superimpose the vertebral image below the slip (here the L5 image) from the hyper-flexion and hyper-extensions of lateral films.

The amount of translation can be measured as the distance perpendicular from a vertical line relative to L5 vertebrae.

Considering magnification distance should not be more than 5 mm in the lumbar or thoracic spine, or more than 3.5 mm in the cervical spine.

This is a reasonable arbitrary line proven by these experimental models as a harbinger of increased rate of structural failure and perhaps risk to neural elements. The best data available considers translational loss of segmental integrity as 3.5 mm or more translation in the cervical spine and 5 mm or more translation in the thoracic or lumbar spine as in figure 6 X-ray A. Other than for L5-S1 where 15 degrees more motion is required, 11 degrees or more rotary motion at one level that an adjacent levels indicates lost structural integrity due to stress shielding.2,14,15,17 Both Translation and rotary stress shielding criteria signify a state future concern for impairment to the patient.
**Table 4: Common Categories**

**Common DREs to Consider**

<table>
<thead>
<tr>
<th>Category</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI(A)</th>
<th>VII(B)</th>
<th>VIII(C)</th>
<th>Class</th>
</tr>
</thead>
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<tr>
<td>Complaints only</td>
<td>(presence)</td>
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<td>Some clinical findings</td>
<td>(presence)</td>
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<tr>
<td>&lt;25% vert. compression</td>
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<td>Post element fracture (no disloc/radic, healed stable)</td>
<td>(presence)</td>
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<td>Transverse or spinous process fracture (with disloc, healed stable)</td>
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<td>25-50% vert. compression</td>
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<td>Post element fracture (with disloc/radic, healed stable)</td>
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<td>Radiculopathy</td>
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<td>Instability</td>
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<td>&gt;50% vert. compression</td>
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<td>Multi-level structural compromise</td>
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<td>Cauda equina - B/B (ok)</td>
<td>(residual)</td>
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<td>Cauda equina - B/B (loss)</td>
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<td>Paraplegia</td>
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<td>Spondylolisthesis - with instability/radiculopathy</td>
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<td>Spondylolisthesis - no instability/radic.</td>
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<td>Spondylolisthesis - with instability/radic.</td>
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<td>Fracture - no instab/radic.</td>
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<td>Fracture - with instability/radic.</td>
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<td>Fracture - with cauda equina</td>
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<td>Dislocation - no instability/radic.</td>
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<td>Dislocation - with cauda equina</td>
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<td>Prev. spine op. - no instab/radiculopathy</td>
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<td>Prev. spine op. - with instability/radiculopathy</td>
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<td>Prev. spine op. - with cauda equina</td>
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<td>Stenosis/facet or disk</td>
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<td>Arthritis - etc. alone</td>
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Notes:
- B/B - bowel & bladder
- Instability - loss of structural integrity
- Disloc. - dislocation
- Radic. - radiculopathy
- Prev. spine op. - previous spinal operation
- Vert. - vertebra

**PREV. SPINE OP.**

- Compression

Timing of DRE determination:
- For most common entities, do not need to wait for the residual response to care or recovery but prior related presence of the finding whether healed or not.
- For more serious problems, consider according to reasonably stable findings (recovery and response to care). These make up a very small percentage of the claims.
BOOK REVIEW


Editors: Steven Mandel, M.D. and Jeanne Willis, D.P.M.,
Reviewer: Mohammed I. Ranavaya, M.D., MS, FRCP, FFOM, CIME

The Handbook of Lower Extremity Neurology by Mandel and Willis represents the collaboration of medical physicians, podiatrists, and other healthcare professionals in the evaluation of lower extremity disorders. The 31 chapters cover diverse areas from traditional neuropathy to impact of Americans with disabilities Act on neurologic impairment of the lower extremity. In this regards it should be noted that Diagnosis of many neurological diseases without understanding the mechanisms involved in gait and the adequacy of the blood supply can be difficult. In the evaluation of patients with neurodegenerative disorders, the recognition of genetics and improvement in diagnostic testing by MRIs and electro diagnostic studies may give information as to the presence of an abnormality and the labeling of a diagnosis, but often it is difficult to prognosticate as to the benefits of treatment and ultimate prognosis.

Disorders of the lower extremity can be the presenting sign or primary manifestation of systemic neurological disease. Alteration in lower extremity mechanics can result in gait abnormalities leading to permanent neuromuscular and skeletal degeneration.

There are those diseases that affect lower extremities which are considered to be work-related, either by way of an acute injury or cumulative, and those disorders which may not be caused by work but which have impact upon the individual performing their job in a safe manner. Impairment and disability issues may be difficult to determine depending upon specific occupational requirements specific to a number of occupations, i.e. DOT regulations in patients with a history of insulin-dependent diabetes or history of seizure, stroke, or hypoglycemia. Diseases such as multiple sclerosis can wax and wane and, although generally progressive, adjustments in both the individual and workplace may be necessitated during periods of exacerbation and further anticipated in those with chronic progressive disease. Neuropathies can produce significant impairments leading to disability that affects work, leisure, and activities of daily living. In addition to the clinical examination a physician performs in the process of doing an impairment rating,

Bibliography

10. Hill, Sir Austin B., CMB, The Environment and Disease Association, Causation? Presidents Address, (1/14/65), In section of Occupational Medicine, p. 195-98.
functional testing may be a necessary consideration, especially those that may affect athletes and high level occupational demands.

Localization is extremely relevant after which one can determine disease entities that may present with those functional alterations. In the workplace, early recognition, occupational surveillance, and determination as to cause and effect relationships are frequently required. Impairments can lead to disability that affects work and leisure, activities of daily living, and quality of life.

Medication including analgesics, anticonvulsants, and antidepressants used to treat painful conditions may itself lead to impairments. The chronic pain patient needs to be differentiated from those with somatoform illness and those who may be malingering. Although one may specialize in one particular area of medicine, in the evaluation of impairment and disability one must be aware of possible abnormalities of a genetic nature that may predispose an individual to a work-related condition or may need to apportion the effect of the workplace injury with those conditions that may or may not be work-related which preceded the work injury.

The book emphasizes that Peripheral nerve lesions can be difficult to differentiate clinically and on the basis of radiological studies alone. Patients with peripheral nerve entrapments can have abnormalities with straight leg raising, reduced range of motion of the lumbar spine, and low back pain. Plantar fascitis, calcaneal nerve entrapments, and heel pain in association with S1 radiculopathy may require electrophysiologic studies such as EMG and nerve conduction studies to aid in differentiation.

The chapters on toxicology discuss chemical exposure and those due to drugs that may occur acutely or may have delayed effects. The EMG and somatosensory evoked potential chapter localizes central versus peripheral nerve lesions. The neuroimaging chapter discusses spine and central nervous system disorders, which may be both acquired and genetically determined. The podiatric chapter discusses special problems in children, but also those illnesses that may initially have been childhood and may not become clinically manifested until adulthood. The chapter on RSD/complex regional pain syndrome outlines diagnostic criteria, specifically emphasizing the difficulties in establishing the diagnosis, the determination of medical impairments, early recognition, and accuracy of diagnosis.

The musculoskeletal chapter evaluates bony deformities that can occur secondary to congenital bony lesions versus those occurring secondary to medical illnesses, i.e. Charcot joints. Entrapment neuropathies can be difficult to recognize. They are frequently axonal and, therefore, nerve conduction studies may not be as helpful as previously thought and may occur in association with spine disorders and generalized peripheral neuropathies, both inherited and acquired. In the chapter on vascular disease, one attempts to differentiate ischemic neuropathy from neurogenic claudication due to spinal stenosis, as well as neurological complications as a result of vascular surgical procedures.

This book is unique because there are number of books related to neurological and musculoskeletal disorders of the upper extremities, similar approaches to disorders of the lower extremities have been less recognized and emphasized. It is hoped that the next edition of this book will continue to evaluate new techniques of gait disorders, MRI findings of the extremities, and a chapter on gait mechanics and ergonomics.

It goes without saying that the Handbook of Lower Extremity Neurology by Mandel and Willis should be on the shelf of medical students, podiatrists, and physicians. It is a very valuable addition, highly recommended for any doctor involved in care of individuals with disability.
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