CLOSED HEAD INJURIES & STROKES:

A PRIMER FOR THE LEGAL PROFESSIONAL

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In order to put post-injury impairment into perspective, it is important to determine pre-existing functional ability and physical condition prior to injury. This information is sought by defense counsel in the determination of financial responsibility, and thus equally important to plaintiff's counsel in supporting a reasonable demand.

Litigated head injuries generally arise from two sources:

1. Accidents
    a. blunt trauma (fall, violent blow or MVA)
    b. penetrating trauma (gunshot)
2. Medical causation (stroke)
    a. ischemic (a clot blocking blood flow to a major artery)
    b. hemorrhagic (rupture of a major artery causing damage to the brain)
    c. TIA or Transient Ischemic Attack (symptoms resolving within 24 hrs)

In all instances, brain injury is affected by blood: either blocked flow (ischemia) or bleeding that starves one area while adding pressure to another area, damaging tissue. The location of the injury is the most important determinant of the severity and likelihood of recovery.

Key Concepts

- Rate and degree of recovery after brain injury is quite variable
- The most common form of traumatic brain injury is the subdural hematoma, with a mortality rate ranging from 50 - 90%.[1] A significant percentage of these deaths result from the pressure on the brain that develops in the days after injury. Treatment of the SDH depends upon the location and age of the lesion. Because bleeding is not static, "Early and sometimes repeated CT scanning may be required in cases of clinical or neurologic deterioration, especially in the first 72 hours after head injury, to detect delayed hematoma, hypoxic-ischemic lesions, or cerebral edema."[2]
- Approximately 20-30% of patients will recover full or significant brain function.
- Although recovery from TIA (transient ischemic attack) occurs within 24 hours, these patients are at a high risk of falls because they may regain mobility before being in full control of their body.

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[1] US Dept of Health and Human Services, **ACR Appropriateness Criteria® head trauma. Bibliographic Source(s)** Davis PC, Brunberg JA, De La Paz RL, Dormont D, Jordan JE, Mukherji SK, Seidenwrum DJ, Turski PA, Wippold FJ II, Zimmerman RD, Sloan MA, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® head trauma. [Online publication]. Reston (VA): American College of Radiology (ACR); 2008. 13 p. [51 references]

[2] http://www.guideline.gov

- Strokes arising from blood clots usually require anticoagulation therapy to prevent further clotting, but improper medication management can result in a fatal hemorrhage

- Because patients can "go bad" quickly, frequent monitoring of vital signs, ICP (intracranial pressure) measurements, lab values, pupil checks and level of awareness is crucial

- A critical part of assessment includes changes, even by one point, in the Glasgow Coma Scale

The Glasgow Coma Scale[3] (GCS) numerically represents the level of consciousness and is based on a 15-point scale for estimating and categorizing the outcomes of brain injury. The patient who is unable to respond verbally or follow commands can nonetheless have a reflexive response to painful stimuli. Families do not appreciate this form of assessment, but the patient's physical response reveals information about how the brain is processing a noxious stimulus. The following signs are associated with a poor prognosis:[4]

- A Glasgow Coma Scale less than 8 in the field
- A Glasgow Coma Scale less than 5 in the ER
- Unequal/changing pupil size
- Presence of alcohol at the time of injury (alcohol increases bleeding)
- Motorcycle accident (direct head impact and no airbag)
- Inadequate respiratory effort that deprives the brain of oxygen

A patient with an acute brain injury is often placed into a medication-induced coma to protect and allow the brain to rest by slowing metabolism. Mechanical ventilation controls oxygen and carbon dioxide levels that can aid in reduction of swelling, and sedation allows an override of the patient's breathing, which is often labored and dysfunctional.[5]

Pain should be managed effectively because it can lead to a rise in intracranial pressure. An intubated patient is treated with short acting sedation and analgesia until time for weaning. "Drug holidays" are periods in which medication is withheld to assess changes in consciousness.

Establishing the presence of pain and suffering in the unconscious patient includes knowledge of impending disaster (even with death cases), knowing the difference between purposeful movements and reflex, and evaluation of post-injury residuals.

In order to put post-injury impairment into perspective, it is important to know who the patient was prior to injury. This information is sought by defense counsel in the determination of financial responsibility, but is equally important to plaintiff's counsel in supporting a reasonable demand.

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[3] Herr K, Coyne PJ, Key T, et al. Pain assessment in the nonverbal patient: position statement with clinical practice recommendations Pain Manage Nurs 2006; 7:44–52

[4] Marion DW, Carlier PM Department of Neurological Surgery, University of Pittsburgh School of Medicine, PA 15213. The Journal of Trauma[1994, 36(1):89-95]

[5] http://www.guideline.gov/content.aspx?id=11468&search=medical+coma+for+brain+injury

Initial Assessment

Mild traumatic brain injury causes temporary dysfunction of brain cells. Serious brain injury results in bruising, torn tissues, bleeding, compression, and long-term complications or death."[6]

Regardless of the mechanism of injury, assessment of brain health/damage follows established guidelines and standards of practice. Despite advances in imaging technology, medical personnel still rely upon assessment tools that have proven their worth over many years; primarily, the non-contrast CT scan.

Patients who initially appear to be at low risk for clinically important brain injury and/or cervical spine injury should be re-examined within an hour by an emergency department clinician.

The Glasgow Coma Scale numerically represents the level of consciousness. The Glasgow Coma Scale is based on a 15-point scale for estimating and categorizing the outcomes of brain injury. The test measures I. Motor response, II. Verbal Response and III. Eye Opening Response. The final score is determined by adding I+II+III, with a lower number indicating a more severe injury and a poorer prognosis. For patients on a ventilator unable to speak, the letter "T" for endotracheal tube is added to the number for future clarity.[7]

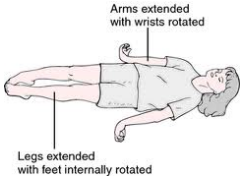
If a patient has a GCS score of 8 or less, a painful stimulus is applied to stimulate a response. A peripheral stimulus (such as hard pinching of an arm) may elicit a reflex response, which is not a true indicator of a motor response. A deep painful stimulus (vigorous sternal rub with the knuckles, for instance) is only used when a patient fails to respond to a lesser form of stimulation.

The patient who is unable to respond verbally or follow commands can nonetheless have a reflexive response to painful stimuli. Families do not appreciate this form of assessment, but the patient's physical response tells a great deal about how the brain is processing this noxious stimulus.

Decorticate and Decerebrate Posturing

Decorticate posturing is an abnormal response to pain in which the patient is stiff with bent arms, clenched fists, and legs held out straight. The arms are bent in toward the body and the wrists and fingers are bent and held on the chest.

Decorticate posturing is a sign of damage to the nerve pathway between the brain and spinal cord. Although it is quite serious, it is usually not as serious as decerebrate posturing (see second image). Either posturing may occur on one or both sides of the body.



[6] http://www.mayoclinic.com/health/traumatic-brain-injury/DS00552

[7] Herr K, Coyne PJ, Key T, et al. Pain assessment in the nonverbal patient: position statement with clinical practice recommendations Pain Manage Nurs 2006; 7:44–52

Glasgow Coma Scale

Eye Opening		
Score	**1 Year or Older**	**0-1 Year**
4	Spontaneously	Spontaneously
3	To verbal command	To shout
2	To pain	To pain
1	No response	No response
Best Motor Response		
Score	**1 Year or Older**	**0-1 Year**
6	Obeys command	
5	Localizes pain	Localizes pain
4	Flexion withdrawal	Flexion withdrawal
3	Flexion abnormal (decorticate)	Flexion abnormal (decorticate)
2	Extension (decerebrate)	Extension (decerebrate)
1	No response	No response

Best Verbal Response			
Score	**>5 Years**	**2-5 Years**	**0-2 Years**
5	Oriented and converses	Appropriate words	Cries appropriately
4	Disoriented and converses	Inappropriate words	Cries
3	Inappropriate words; cries	Screams	Inappropriate crying/screaming
2	Incomprehensible sounds	Grunts	Grunts
1	No response	No response	No response

A patient with an acute brain injury is often placed into a medication-induced coma to protect and allow the brain to rest by slowing metabolism. Mechanical ventilation controls oxygen and carbon dioxide levels that can aid in reduction of swelling, and sedation allows an override of the patient's breathing, which is often labored and dysfunctional.

An important question in the evaluation of pain and suffering surrounds the issue of reflexive response to pain: what is the patient processing internally in response to pain?[8] Should the unconscious patient be medicated prophylactically for pain? The answer to the first question is, we do not always know. The answer to the second question is "yes".

[8] Herr K, Coyne PJ, Key T, et al. Pain assessment in the nonverbal patient: position statement with clinical practice recommendations Pain Manage Nurs 2006; 7:44–52

A Case in Point

Consider this case of a young man who was involved in a devastating bus crash. One of the questions asked was that of pain and suffering. He only survived for a few minutes (or even seconds) after the crash.

This young man (we'll call him Barry) probably died upon impact. Propelled through the windshield and down a 60-foot embankment, he landed head first on a large pile of rocks. Barry was pronounced dead at the scene and his family was devastated at the thought of his last moments spent alone and in pain. This haunting memory was the impetus for a claim of Barry's pain and suffering as well as their own.

An autopsy revealed massive head trauma with multiple skull fractures. His aorta, the largest artery in the (chest) body, was cleanly dissected, with more than half his body's blood volume compressing his lungs. The attorneys in this case needed help with several considerations.

- *Did Barry die upon impact or did he suffer in the 15 minutes it took EMS to find him? The autopsy report revealed three skull fractures, the most severe at the base of the brain in the area that controls basic life function. The Medical Examiner believes Barry's jaw struck first, forcing the head backwards. Research of the mechanics of this shearing injury and discussions with a neurologist suggest that he was instantly unconscious and did not suffer.*

- *Absent his head injury, would Barry have died from the severed aorta alone, and how long does it take to bleed to death internally? Statistics indicate that death would have occurred within 1 ½ to 2 minutes from a combination of compressed lungs and blood loss. With his aorta completely dissected, every beat of Roy's heart was literally killing him.*

- *The neurological and cardiovascular findings supported immediate unconsciousness and rapid demise, and his teammates said that he was asleep at the time of the crash. Ostensibly, this addressed the issue of pain and suffering.* ***But what about the time between sleeping and impact?*** *Was he jolted awake? Was there a time when Barry was aware of impending disaster?*

- *No one observed Barry in the chaos to know if he was frightened and aware in those seconds between the initial crash and his final impact, but the possibility had to be considered in the award to his grief-stricken parents.*

This question was central in the controversial Maryland ruling on a 2006 drowning of a five year old boy at Crofton Country Club. The parents sued for pain and suffering, but summary judgment was barred from consideration. The jury's recommendation to remove non-economic caps and award the parents additional money for the ***child's*** *pain and suffering made this an important legal case. The jury came back with a 4 million dollar verdict, and the award was reduced to 1 million due to Maryland's cap. The trial judge, however, would not include pain and suffering because the drowning was unwitnessed and the parents could not "prove" that he was aware of impending death. The appellate court reversed, but the Court of Special Appeals upheld the ruling for lack of proof. The court of public opinion and anguished parents disagreed.*

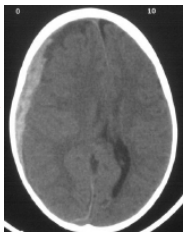
Blunt Trauma

Causation: Blunt trauma means a non-penetrating injury. An MVA, blow to the head, fall, or even an impact with the floor during a violent seizure can result in brain damage from bleeding. Some patients are more prone to bleed from blunt trauma due to medications, age, or underlying disease.

The most common result of blunt trauma is the SDH or subdural hematoma (A hematoma is a collection of blood, and the subdural space is located between lining of the skull and the actual brain. This space is very confining, so any increase in fluid level will put pressure on underlying brain tissue). Subdural hematomas can also arise spontaneously. CT scans are the primary tool used to "age" an SDH based upon the density of the blood (denser = older).

Diagnosis and Aging: CT scans without contrast remain the most common and appropriate method of diagnosing hematomas in brain injury. The limitation is that "axonal" or "shearing" injuries are harder to visualize on CT than MRI because these injuries are not confined to a specific location.

The image to the right is a CT scan of an subdural hematoma that arose from blunt trauma. Notice the white shading on the left side, between the bright white space and the darker brain matter. This is blood, creating pressure on the left side of the brain that shifts against the right side. More shift = more pressure and potential damage.



"Acute" means <72hrs old, "subacute" begins within 3-7 days, and chronic begins at Day 21.[9]

Subdural hematomas often result in delayed brain damage with devastating outcomes and a high mortality rate of ~60-90%.

The Stroke Victim

83% of strokes are ischemic, which means that a cerebral artery is occluded, blocking blood flow to an area of the brain and resulting in death of tissue.

TIA (Transient Ischemic Attack) is a mild form of stroke that results from a brief or partial blockage of blood flow. The symptoms are similar to an ischemic stroke but disappear within 24 hours. Usually, no permanent brain damage occurs as a result of a TIA but ~one-third of these patients will have an acute stroke in their future. According to the National Stroke Association, approximately 5 million Americans have experienced at least one TIA, the symptoms of which can include dizziness, imbalance, loss of coordination, confusion, difficulty speaking or understanding,

[9] http://emedicine.medscape.com/article/1137207-overview

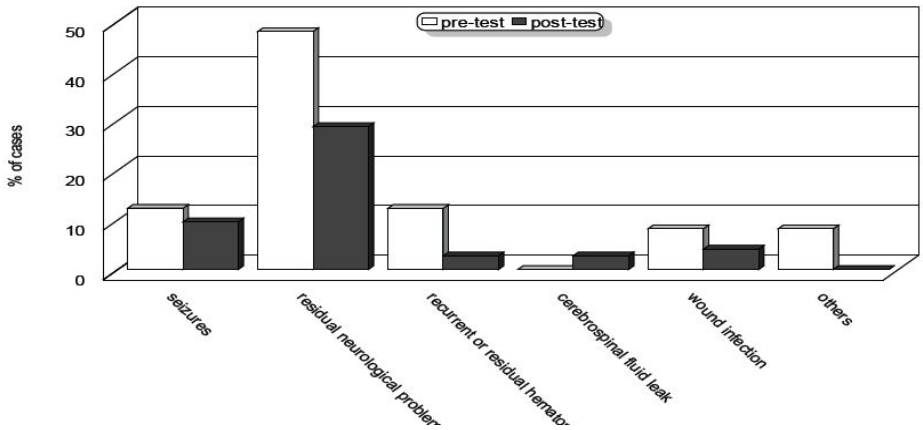
and generalized weakness. **Because TIA symptoms are temporary, these patients are at a high risk of falls. They may become mobile before fully coordinated or oriented.**

Hemorrhagic stroke occurs when a blood vessel ruptures or is torn, allowing blood to leak into surrounding brain tissue or the ventricles of the brain. The amount of bleeding is less important than the location. A small bleed in the brainstem is devastating since this small area controls basic life functions.[10] If rapid bleeding occurs, there are limited interventions aside from surgery, and patients may not be stable enough for the procedure.

Nursing care makes a difference. These data compare patient recovery pre- and post-implementation of postoperative nursing care standards in an Egyptian hospital, as reported in a 2012 article from the Journal of American Science:[11]

Table (7): Comparison between GCS of patients as regard pre and post implementing postoperative nursing care standards

GCS	Pre (n = 73)			Post (n = 73)			P- value
	No.	%	X +SD	No.	%	X +SD	
Mild	52	71.2	13.84±1.34	59	80.8	14.19±1.32	P= 0.122 n.s
Moderate	21	28.8		14	19.2		
Severe	-	-		-	-		



There is a third stroke situation termed "ischemic hemorrhagic conversion stroke". When a patient presents to the ER with an ischemic stroke, physicians often prescribe anticoagulation therapy. But treatment of a stroke from a blood clot **involves careful monitoring of blood clotting studies and fall prevention techniques, because overmedication can result in a fatal hemorrhage.**

[10] http://www.theuniversityhospital.com/stroke/types.htm

[11] Hala M. Ghanem and Roshdy Abd El-Aziz El-khayat, Chronic Subdural Hematoma: Effect of Developing and Implementing Postoperative Nursing Care Standards on Nurses Performance for Reduction or Prevention Postoperative Complications. Journal of American Science 2012; 8(2):686-697]. (ISSN: 1545-1003). http://www.americanscience.org

Recommendation for anticoagulation from the current AHA/ASA recommendations for the treatment of ischemic stroke and (TIA)[12]	**Class/Level of Evidence**
For patients with noncardioembolic ischemic stroke or TIA, antiplatelet agents rather than oral anticoagulation are recommended to reduce the risk of recurrent stroke and other cardiovascular events.	**Class I, Level A**
Aspirin (50 to 325 mg/d) monotherapy, the combination of aspirin and extended-release dipyridamole, and clopidogrel (*Plavix*) monotherapy are all acceptable options for initial therapy.* (2008 Addendum)	**Class I, Level A**
The combination of aspirin and extended-release dipyridamole is recommended over aspirin alone. (2008 Addendum)	**Class I, Level B**
Clopidogrel may be considered over aspirin alone on the basis of direct-comparison trials.	**Class IIb, Level B**
For patients allergic to aspirin, clopidogrel is reasonable.	**Class IIa, Level B**
The addition of aspirin to clopidogrel increases the risk of hemorrhage. Combination therapy of aspirin and clopidogrel is not routinely recommended for ischemic stroke or TIA patients unless they have a specific indication for this therapy (i.e., coronary stent or acute coronary syndrome).	**Class III, Level A**

- **Class I** indicates general agreement
- **Class IIa** indicates conflicting opinion but the weight of evidence is in favor of treatment
- **Class IIb** indicates that efficacy is less well established by evidence or opinion
- **Class III** indicates this therapy is not useful/effective and may be harmful
- **Level of Evidence A** indicates data derived from multiple randomized clinical trials
- **Level of Evidence B** indicates data derived from a single randomized trial or nonrandomized studies

Case in Point

Mr. Ischemic was admitted to the ER with a diagnosis of stroke; he was a known fall risk. This stroke diagnosis was later downgraded to a TIA because his left-sided paralysis completely resolved within 24 hours. He was already taking two anticoagulant drugs at home, and yet his internist added a third, then a fourth blood thinner to his regimen. Mr. Ischemic's complaint of weakness on Day 4 was charted by both physician and nurse, but no additional precautions were taken for his safety. He fell the morning of his planned discharge and died from brain hemorrhage < 24 hours later. The hospital denied the fall and advised against an autopsy, but we uncovered a chest x-ray that revealed rib fractures not present the day before his fall. Natural inference, poor nursing documentation and failure of the physician to follow Guidelines resulted in the family's successful pursuit of recovery.

[12] These recommendations are a national standard, and a combination of the National Guideline Clearinghouse (NGC), American Heart Association/American Stroke Association (AHA/ASA); http://www.guideline.gov/content.aspx?id=12950&search=mri+safety+with+stent

Observation & Treatment

Minimum Documented Observations (from the most current 2007 Guidelines)

For patients admitted for head injury observation the minimum acceptable documented neurological observations are GCS, pupil size and reactivity, limb movements, respiratory rate, heart rate, blood pressure, temperature, and blood oxygen saturation.

Frequency of Observations

Observations should be performed and recorded on a half-hourly basis until GCS equal to 15 has been achieved. The minimum frequency of observations for patients with GCS equal to 15 should be as follows, starting after the initial assessment in the emergency department:

- Half-hourly for 2 hours
- Then 1-hourly for 4 hours
- Then 2-hourly thereafter

If a patient with GCS equal to 15 deteriorates at any time after the initial 2-hour period, observations should revert to half-hourly and follow the original frequency schedule.

Patient Changes Requiring Review While Under Observation

Any of the following examples of neurological deterioration should prompt urgent reappraisal by the supervising doctor.

- Development of agitation or abnormal behavior
- A sustained (that is, for at least 30 minutes) drop of one point in GCS
- Any drop of three or more points in the eye-opening or verbal response scores of the Glasgow Coma Scale, or two or more points in the motor response score
- Development of severe or increasing headache or persisting vomiting
- New or evolving neurological symptoms or signs, such as pupil inequality or asymmetry of limb or facial movement"[13]

The following signs are associated with a poor prognosis:

1. A Glasgow Coma Scale less than 8 (see chart, page 7) in the field
2. A Glasgow Coma Scale less than 5 in the ER
3. Unequal/changing pupil size
4. Presence of alcohol at the time of injury (alcohol increases bleeding)
5. Motorcycle accident (direct head impact and no airbag)
6. Problems with ventilation, further depriving the brain of oxygen

[13] http://www.guideline.gov/content.aspx?id=11468&search=medical+coma+for+brain+injury

When Things Go Wrong

"Iatrogenic" refers to complications that arise out of healthcare, such as nosocomial (hospital-acquired) infections, drug dependency, unnecessary surgeries, or poor outcomes from treatment. In its worst form, iatrogenic complications result in death.

The brain is a fragile organ, sensitive to changes in pressure and electrolytes, while concurrently resistant to many medications whose molecules are too large to cross the blood-brain barrier. We are constantly reminded that our bodies are ~70% fluid. That fluid is composed of electrolytes: salt, potassium, magnesium, calcium and other agents. The concentration of salt in the normal state is a constant 0.9%.

IV fluid replacement is usually 0.9%, or "normal saline". The salt concentration can be altered depending upon the goal of treatment. Axonal, or shearing injuries, result in diffuse swelling that in the early stages may go undetected by all but the most sensitive MRI scans.

Surgery cannot address this type of swelling; it must be managed through mechanical ventilation, medication, or sometimes, the administration of hypertonic saline solution – usually 3%. The effect of hypertonic saline is to act as an osmotic draw on the brain to reduce swelling, and it is also beneficial in reducing swelling in isolated hematomas.[14]

This manipulation of the body's sodium content is a delicate process because serum sodium levels can rise fairly quickly. Levels must be checked at least every six hours; the hypertonic saline rate decreased as the optimum level is approached, and discontinued when that level is reached. Mismanagement can result in kidney failure and soon thereafter, death.

Case in Point

Jason was an 18 year old boy with a severely swollen brain and numerous injuries including a punctured lung and abdominal trauma with infection. He was placed into a medical coma and mechanically ventilated, but none of Jason's injuries were fatal but for a medical resident's error.

Here is what happened.

The medical resident ordered a hypertonic (concentrated) IV saline solution. Per protocol, serum sodium levels were drawn every six hours. As his sodium levels rose, the lab called attention to the nursing staff; nurses documented these levels in the chart, and called the results to the resident. All of this was documented properly. And yet, the resident and his colleagues allowed the solution to run 18 hours longer than it should have. By the time the IV solution was removed, kidney failure, pulmonary edema and heart failure were irreversible. While his

[14] Contin Educ Anaesth Crit Care Pain (2012) 12 (2): 82-85. doi: 10.1093/bjaceaccp/mkr063 First pub'd online: January 12, 2012

malfunctioning heart (that muscle is very potassium-sensitive) allowed fluid to build up in his lungs, the rest of Jason was being dehydrated by the hypertonic draw of sodium. Death came within 22 hours.

From the legal perspective, not only was there clear liability on the part of the bus driver, now the hospital was equally liable for malpractice.

Recovery Considerations

Intervention into the care and management of a brain-injured patient becomes personalized after hospital discharge. Many factors are at play, including family financial resources, social support, insurance coverage and a well-planned rehabilitation course.

While there is much that can be done to assure excellent rehabilitation care, some variables are not under the direct control of others.

One consequence of brain injury may be changes in personality. Irritability and outright aggression are not unusual, and while family may be willing to support these changes in the short run, they can soon become exhausted.

It is an undeniable truth that bad things happen to good people. But sometimes, bad things happen to not-so-nice people, and the family's willingness to work with post-injury personality problems is related, in part, to the pre-injury or pre-stroke relationship they enjoyed.

Case in Point

This is less about head injury and more about human nature and tolerance. Roy was a young man of 22, involved in the same collision as Barry, but his injuries were objectively the least severe of the six athletes I was asked to evaluate. He sustained an uncomplicated lumbar fracture and a wrist strain, but no head injury or internal damages. Nonetheless, I felt he would demand a disproportionate amount of compensation for his pain and suffering, because his pain complaints were increasing over time despite complete healing. He proceeded from a second to a third and a fourth opinion on his ability to play ball again, and his worried mother encouraged this behavior, but why? The review of past medical and academic records revealed that he was an anxious young man who in the past always self-medicated with marijuana and Valium, had two DUIs, was a mediocre student and was often on the bench. Simply put, his prospects prior to the accident were never assured. He may have been unconsciously using his injury to justify his continued poor performance.

With Roy's urgent complaints and his mother's anxiety, and without knowing his medical history and objective findings, one could easily overestimate future medical costs. To most, a non-displaced T12 compression fracture with 15 degree step-off sounds like lasting damage. But this vertebra is healed, and Roy has no objective limitations. This puts Roy's demands into perspective, and that was important for both sides. When there is a global payout to be proportionately shared among multiple clients, don't you want the patient who needs the most to receive the most?

What Lies Ahead

Aptitude and residual skill can be reliably assessed through neuropsychological evaluation, and this testing is usually repeated at prescribed intervals to measure ongoing recovery. However, test results must be weighed against pre-injury abilities. A very common complaint is memory deficit, and even this is difficult to quantify because anxiety and depression strongly influence tje ability to concentrate. And, because the injury is in focus, patients and family tend to dwell upon deficits and sometimes forget that dad never could find his glasses.

- What was your client's academic and/or work history, career aspirations (and potential), history of drug or alcohol use and criminal record? Having this information will help structure an informed demand, and family is usually not the most reliable source of information.
- If the injury was an MVA, assault, or other traumatic event, is there evidence of Posttraumatic Stress Disorder? If so, does the Disorder affect activities of daily living, or is the effect confined to limited settings that can be avoided in the future.
- Is psychological care required or recommended, and is family therapy indicated?
- What are the physical, occupational and speech therapy needs of the patient?
- Will medication, assistive devices, home and vehicle modifications be required?
- If the patient is still in school, will special accommodations in the form of spaced learning or a note-taking assistant be required?
- At what point will your client be at MMI and who will determine PPD ratings if appropriate?

So, what will be the true "cost" of this event going forward? Cost is never confined to financial considerations, if only because significant relationships are affected by illness or accident. To those who would challenge that statement, ask them how long they are willing to humor the irritable spouse with a cold, tolerate wearing a cast, or use crutches for a simple ankle sprain. In the case of brain injury, the cost is both economic and intensely personal.

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