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Crash Forensics Press Release

How do I choose and expert?

An expert is required when a traumatic event occurs in which two parties disagree regarding the extent of the trauma and subsequent benefit need.

A traumatic event in regards to a motor vehicle trauma is when forces experienced by an occupant during the various stages of a collision exceed or are greater than what is tolerable for specific body regions. These forces can cause minor to catastrophic injury, unfortunately due to the nature of the injuries sustained, current technologies today are not sensitive enough to detect some of these types of injuries.

- Nordhoff LS: Motor Vehicle Collision Injuries. Biomechanics, Diagnosis, and Management. Second Edition. Mississauga Ontario Canada 2005.

For this reason, an expert must have both a biomechanical and medical background which allows for an analysis of injury mechanisms as well as an appreciation of bodily structures, these structures relation to function and pain.

Biomechanics

Biomechanics as related to motor vehicle trauma applies to the examination of internal and external mechanical forces acting on a biological system during a crash. Biomechanical experts are commonly used to tie the accident reconstruction aspects of a collision to a physicians diagnosis. However as biomechanists lack the training or license to make a formal diagnosis, as this would be a practice of medicine without a license, many courts have not allowed biomechanists to comment on diagnosis and thus injury.

- Nordhoff LS: Motor Vehicle Collision Injuries. Biomechanics, Diagnosis, and Management. Second Edition. Mississauga Ontario Canada 2005.

In regards to the **"biological" portion of the filed of biomechanics**, an expert should have a vast array of training as humans are diverse and anatomical variations are quite common.

Specific training should include but not be limited to:

1. Formal university and graduate course work in Anatomy including cadaver dissection (essential to appreciate anatomical variations from person to person).
2. Formal university and graduate functional anatomy course work. This course work should educate the person on what happens to anatomical structures within the human frame when they move through various stages of motion specific to a motor vehicle crash. In general kinesiology is an excellent university/graduate program which allows for education in joint movement through various stages of motion. This study would also allow for a general knowledge basis of what muscles are active in various motions and the roles of ligaments, muscles and tendons in motion actions.
3. Training in human factors which increase a person's susceptibility to injury.
4. Clinical experience observing occupants in crash tests or crash test dummies in impacts of various speeds and collision vectors. There are over 20 types of crash test dummies, and though test information obtained from the usage of these dummies help to expand our knowledge of injury mechanisms and potentials, live full scale human volunteer crash testing is the gold standard in order to truly understand the occupant reaction that occurs in varying vector collisions and high and low speeds.
5. Real world experience. Though not a specific requirement, anyone can read a book or paper and render an opinion. This opinion is only an expert opinion when it can be based on both academic and clinical experience.

- Nordhoff LS: Motor Vehicle Collision Injuries. Biomechanics, Diagnosis, and Management. Second Edition. Mississauga Ontario Canada 2005.

The **mechanical portion of a biomechanists training** in regards to motor vehicle trauma should include the following knowledge and training.

1. Significance of calculated delta-V of the occupant's vehicle from the reconstructionist.
2. Collision dynamics, angle of impact and PDOF relative to how the occupant's body would react and move inside/outside of the vehicle.
3. Duration of impact knowledge and the importance of time in regards to injury causation. In addition, how PDOF, vehicle motion and impact type (collision vector) can significantly affect time elements during a crash.
4. Photography usage of occupant's in a vehicle to analyze position relative to the interior of the vehicle and the striking vehicle. Without inspection of the occupant in the vehicle, risk cannot be completely evaluated.

- Nordhoff LS: Motor Vehicle Collision Injuries. Biomechanics, Diagnosis, and Management. Second Edition. Mississauga Ontario Canada 2005.

The field of biomechanics is vary broad, with mechanical engineers, physics, kinesiology, mathematics, biomedical engineering, biomechanics, accident reconstructionist and doctors (medical and chiropractic) attempting to act as experts. **The above qualifications should be a starting point for your expert, not an ending point**. In addition to the above mentioned, an expert should consider a number of other collision variables and human factors to lengthy to discuss in this short press release.

How are Biomechanists used?

1. Convince a jury or arbitrator that the forces experienced in a specific region of the body (by determine delta V) of the collision (based on accident reconstruction) was or was not sufficient to cause injury.
2. If considering contribution to negligence, a biomechanists can be used to determine if a seatbelt was on or off and what injuries could have occurred dependent on the situation.
3. Equate the forces involved in the collision to general activities of daily living. *This however does not consider time or pain.

- Nordhoff LS: Motor Vehicle Collision Injuries. Biomechanics, Diagnosis, and Management. Second Edition. Mississauga Ontario Canada 2005.

Accident Reconstructionist

Auto crash reconstructionist are (usually) specially trained people (mostly police officers) who can frequently determine causation of an accident using a number of sophisticated and, frequently, ingenious methods. Accident reconstruction requires the gathering of tangible evidence collected at the accident/crash scene in order to determine specifics about the crash. This evidence might include a scaled police drawings of the crash scene, eye witness accounts of the collision, photographs of the collision, actual inspection of the involved vehicles, or photographs of the crash scene showing skid marks, tire marks, gouges in the roadway, debris, body fluids etc. The quality of the outcome of these reconstruction reports parallels the quality of the input of information gathered and collected at the collision scene, and this becomes a defining statement in accident reconstruction.

– Foreman SM, Croft AC: Whiplash Injuries. The Acceleration / Deceleration Syndrome. Third Edition. Philadelphia United States 2002.

In regards to training, an expert should have accident investigation and accident reconstruction training that should include:

At Scene Investigation	Vehicle Dynamics	Speed Determination	Human Factor Analysis	Evidence Retrieval and Analysis
Series of Events	Tire Evaluation	Slide to Stop	Crash Causation	Event Data Recorder
Roadway Evidence and Analysis	Restraint System Evaluation and Analysis	Negative Slide to Stop	Series of Events	Retrieval and Analysis
Drag Factor / Coefficient of Friction Analysis	Braking Efficiency	Time Distance	Crash Fault Determination	
Forensic Mapping	Lamp Examination	Critical Curve Speed Analysis	Crash Awareness Analysis	
Scaled Diagrams	Pedestrian Collision	Yaw Speed Analysis		
Scene Grade Analysis	PDOF, Force Determination	Acceleration Analysis		

At Scene Investigation	Vehicle Dynamics	Speed Determination	Human Factor Analysis	Evidence Retrieval and Analysis
Scene Superelevation Analysis	Vehicle Crashworthiness			
At Scene Photography	Bumper Standards Analysis			
Systemic Collision Investigation	Roof Crush Analysis			

The filed of accident reconstruction is vary broad, with mechanical engineers, physics, biomedical engineering, biomechanics, accident reconstructionist and doctors (medical and chiropractic) attempting to act as experts. **The above qualifications should be a starting point for your expert, not an ending point**.

How are Accident Reconstructionist used?

1. Describe events leading up to the collision.
2. Opinion of if an injury is possible. * Due to the complexity of the human body, pain processing and risk factors, though ACR's can attempt to describe a possible injury due to forces found to have occurred during the collision, caution must be used as variables can exist which can result in changes in injury patterns not expected with general PDOF calculations. The best example is a coup counter coup head injury. An ACR could determine contact with the occupant's head and vehicle, however they would not be able to evaluate the occupant to see if the opposite side of the head was injured, or if a pressure gradient change occurred causing deeper brain lesions.

Doctor (Medical or Chiropractic)

Determination and diagnosis of a persons injury presentation is an inherent part of managing a motor vehicle collision and resulting benefit need determination. This starts with the history and examination of a

patient. A proper diagnosis is a guide to treatment need, and allows for the best possible chance for patient recovery to occur. In addition, an examination allows for underlying pathology to be ruled out.

There is no typical patient and there is no typical crash. For this reason generalized ideas of anatomy or a basic understanding of anatomy can not equate to the ability to make an injury determination. As noted above, a minimum standard in regards to training would include formal university and graduate course work in Anatomy including cadaver dissection (essential to appreciate anatomical variations from person to person), Neurology including understanding of neurological signs and/or symptoms, Orthopedic testing allowing for a structure specific injury determination to be made and general pain concepts including referral patterns. Furthermore, the evaluator has to be aware of red flags and risk factors associated with the patient which can influence the traumatic event by either mitigating or exacerbating injury potentials.

The **doctors training** in regards to motor vehicle trauma should include knowledge in the following area's.

1. Injury pathophysiology obtained through specific whiplash traumatolgy post graduate CE course work.
2. Anatomy including cadaver dissection
3. Neurology including understanding of neurological pathology and testing procedures.
4. Orthopedic Testing including ability to differentiate between soft tissue structures in the same anatomic region.
5. Soft Tissue understanding including ability to determine Referral Patterns, differentiate between tissues depending on fiber orientation and innervation knowledge.
6. Concussion Testing. Motor vehicle trauma results in over 30% of reported head injuries with three primary injury mechanisms. Simply being able to report the direction of force relating to the occupants head movement is not sufficient in evaluating a possible injury potential.
7. Brain Stem Testing
8. Dorsal Column Testing
9. Pain Concepts and Syndromes Knowledge
10. Special Condition knowledge (TOS, CTS, etc)
11. Understanding of complicating factors
    a. Age
    b. Gender
    c. Systemic Disorders
    d. Congenital Abnormalities
    e. Degenerative Disc Disease
    f. Spondylosis
    g. Facet Arthrosis
    h. Prior Injury/Surgery
    i. Prior Medical Condition
12. Special Imaging (x-ray, MRI, CT) and lab testing knowledge
13. Rehabilitation and treatment protocols

The authors of the Quebec Task Force on Whiplash Associated Disorders, published in Spine supplement edition April 1995 indicated that whiplash is not taught in medical school, chiropractic school, occupational therapy or physical therapy school and that voluntary post graduate education is required in order to have a basic understanding of whiplash.

Typical providers which can evaluate whiplash injury include, ER Physicians, General Practitioners, Internist, Chiropractors, Physical Therapists, Orthopedist, Diagnostic Radiologist, Neurologist, Anesthesiologist, Dentist, Occupational Therapist, Osteopath, and Psychotherapist. Please note that those these providers have a basic understanding of medical concepts listed above, secondary voluntary post graduate training is required in order to provide expert opinion of need related to motor vehicle trauma, as injury mechanisms are unique and dependent on occupant and crash variables.

How are Doctors used?

1. Determine injury
2. Determine benefit need (including treatment).
3. Determine long term future care need (if any).