



FLIGHT ROUNDS

SUMMER 2011

CASE STUDY:

Acute Management of Traumatic Brain Injuries

by Leif Erickson, CCEMTP

FLIGHT FOR LIFE – Waukesha/Milwaukee Base

Introduction

Flight For Life (FFL) frequently transfers patients with Traumatic Brain Injuries (TBI). These patients are transferred from the scene where the injury occurred, such as motor vehicle crashes (MVC), industrial sites, falls, sporting events, and assaults – or from community hospitals to Level I or II verified Trauma Centers. TBI patients are in acute need of interventions to quickly and efficiently minimize the rise in intracranial pressure (ICP), stabilize the injury, and stop secondary injuries from occurring. Once the patient's primary TBI has been managed, the months and often years ahead include intensive ongoing care and rehabilitation. The goal of returning a patient to complete cognitive and physical capabilities is often difficult, if not impossible, to achieve. The initial identification and treatment of a TBI is often performed at the pre-hospital level by providers ranging from First Responders through Advanced Life Support. Pre-hospital recognition, stabilization, and timely transfer to an appropriate hospital can positively impact patient outcome.

Case Review

Flight For Life – Waukesha/Milwaukee responded to a MVC on a warm summer night. FFL was dispatched shortly after 1:00 am to a rollover MVC on an interstate highway where a single occupant had been ejected from the vehicle. From the initial mechanism of injury (MOI) information obtained, the flight crew began to formulate a plan of care and interventions for potential injuries the patient might have sustained. At interstate speeds, the injuries incurred in a crash are often significant; managing injuries suffered in this setting can test the skills and abilities of even the most seasoned/experienced provider. Ejection of a person during a vehicle roll over will likely cause severe injuries.

Upon arriving at the scene, a preliminary survey by the flight team revealed a destroyed metal guardrail, the only

Kinetic Energy “Energy in Motion”
Expressed in units or joules
Is calculated by:

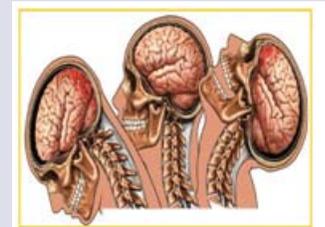
$$\frac{1}{2} (\text{mass}) (\text{velocity}^2)$$

150 lb (68 kg) person travels at 30 mph (48 kph)
KE units = (150/2) (302) = 67,500

One joule is equal to the amount of energy required to lift an average size apple one meter straight up.

Biphasic defibrillation is approximately 150 joules.

If traveling at a speed of 30 mph, the human body strikes the windshield or dashboard with 67,500 joules. (68 kg person)



PHTLS, 6th Edition, Reference¹

noticeable identification that a MVC had occurred. No vehicle or skid marks were visible. The energy required to destroy a metal guardrail is substantial, indicative of a significant MOI.¹ EMS personnel were providing care to a young male patient. The patient had been immobilized and intubated; an excellent patient care report was given to the flight nurse and flight paramedic. EMS caregivers did a great job managing the patient, which reduced the “bedside time” of the FFL team to six minutes. After a rapid trauma assessment of the patient, verification of endotracheal tube (ETT) placement, and ensuring that paralytics/sedation had been administered (as well as noting the time given), the patient was transferred to the FFL cot.

continued on page 2

Traumatic Brain Injuries

(continued from page 1)

Based on the report and the patient's presentation to EMS personnel, a closed TBI was probable. As the patient was loaded into the helicopter and the rear clamshell doors closed, the crew noticed a slight movement of one of the patient's feet. The medical team decided to administer additional sedation medications to the patient. As this was being done, the patient began to tear from both eyes (a sympathetic response), his cricothyroid cartilage began to move – which is evidence of swallowing – and the patient simultaneously began to have a return of mild, spontaneous respirations.

It had been approximately 30 seconds since boarding the aircraft; time was of the essence, and it was obvious the paralytics were metabolizing quickly. The patient began reaching for the ET tube and becoming restless. The flight team maintained a firm grasp on the ET tube and held both of his arms while administering a long lasting paralytic. The pilot was communicating departure information to the FFL Flight Communication Specialist and General Mitchell International Airport Tower, with no idea what was happening in the patient cabin.

Neither of the medical crew was able to activate their helmet microphones because the patient had to be restrained from extubating himself – thus they were unable to communicate with the pilot. A few tense moments ensued, during which the patient pulled out one of his IV lines; additional medications to provide sedation were administered via the alternate IV site. Ultimately, the medical crew was able to notify the pilot of the situation, and the aircraft was shut down until the first priority – safety – was assured. Once the medications were able to take effect, and the patient's combative condition was under control, a clinical assessment was repeated. ETT placement, with appropriate ETCO₂ and waveform, was confirmed. All crew members re-evaluated the situation regarding safety and patient management; a joint decision concluded that the transport could proceed, and the patient was transferred to a Level I Trauma Center. The entire incident as described took minutes from the time the FFL team noticed the patient move his foot to having the patient re-paralyzed and sedated. Safety as the first priority, and excellent medical care, were both important components in this patient transfer.

Discussion

TBI can occur with or without injury to other areas or systems of the body and is typically induced by an acute event, very similar to other traumatic injuries. Traumatic brain injuries differ from this point forward based on initial functional factors and recovery. TBI is defined as damage to brain tissue caused by an external force. This can also be referred to as energy transfer from another object, fixed or in motion, which includes the fixed portion of the skull.¹

Report provided to the *FLIGHT FOR LIFE* team:

- Male patient
- Weight: approximately 100kg
- Age: approximately 20 y/o
- Airway: clear, blood noted in and around mouth
- Ear: blood present
- Breathing: rapid, equal chest rise
No SQ air or crepitus noted. Intubated 7.5 OETT, 23 cm at teeth, ETCO₂ 40/waveform appropriate. BVETT rate - 12/min
- Circulation: positive peripheral pulses, no significant blood loss, skin warm, mild diaphoresis noted
- Pupils: equal
- Glucose: 134
- Moves all extremities
- Prior to FFL arrival:
 - ◆ 2 PIV's established; 5 mg Versed and 200 mg Succinylcholine administered
 - ◆ Patient intubated
- PTA: Combative, LOC-altered

Evidence of a TBI is documented by loss of consciousness, post-traumatic amnesia (PTA) due to brain trauma, or by objective neurological findings that can be reasonably attributed to TBI.² TBIs can include open and closed injuries, and encompass a wide range of injuries including subdural, epidural, and subarachnoid injuries, along with various skull fractures and penetrating forces. TBI changes many aspects of the patient's life depending on the area(s) of the brain that have been injured and the severity of the injury. The magnitude of this acute traumatic event impacts the patient's personality, cognitive and functional abilities, sensory control(s) and, at times, every aspect of a patient's life. This is very different from a non-life threatening extremity injury or other injuries that do not affect brain function. The brain is very fragile and complex; it does not tolerate injury, increased pressure, hypoxia, or other abnormal changes. Appropriate treatment is crucial from the onset of injury and pre-hospital care through rehabilitation. Health care providers at all levels can significantly impact the patient's outcome as they work together to initiate aggressive appropriate treatment.

The spectrum of disabilities and symptoms that are associated with a TBI increase the complexity of these cases. The Centers for Disease Control (CDC) utilizes the initial Glasgow Coma Scale (GCS) to identify the severity of TBI. Three categories are utilized when identifying a TBI: mild, moderate, or severe. Mild: GCS 13-15, Moderate: GCS 9-12, and Severe: GCS 3-8.³ Other factors can be utilized and are dependent on the practitioner and/or medical direction. These factors can include, but are not limited to: length of time the patient was unconscious, the level of confusion/disorientation, and amnesia. The signs and symptoms vary from case to case. Mild, the most common, is often not detected at

continued on page 8

Rehab, Support Group Helps TBI Patients

by Megan Kilcoyne, MPT
Advocate Lutheran General Hospital

Imagine waking up and not remembering where you are or not being able to get up without someone's help. Imagine needing someone to supervise you while you go to the bathroom. These scenarios are all too real for a patient with a severe brain injury. Every year, millions of lives are forever changed due to a traumatic brain injury. A traumatic brain injury (TBI) occurs when the head suddenly and violently hits an object, or when an object penetrates the skull and hits the brain. TBIs can occur with a fall, collisions involving cars, motorcycles or bicycles, sports injuries, explosive or blast injuries or violence. The people most at risk are children, teenagers, males and adults over 65 years old. TBIs are classified as mild, moderate or severe. A person's symptoms depend on the severity of the TBI. A person with a severe head injury may initially be in a coma. They may suffer from muscle paralysis, impaired cognition, impaired memory, behavioral issues, communication impairments, emotional changes or sensory problems. Most people with a severe TBI will require rehabilitation. The rehabilitation team includes the physiatrist, physical therapist, occupational therapist, speech therapist, neuropsychologist, nurse, social worker, recreational therapist and vocational counselor. These teams of experts work together to help the patient with a TBI re-learn basic skills such as walking, talking or getting dressed. The goal of rehabilitation is to help the patient achieve as much independence as possible. Rehabilitation begins in the hospital and may continue on to an inpatient unit, outpatient facility or a residential treatment center. The brain is very complex and the recovery from a brain injury can take years; there could always be some permanent damage to the brain which may never lead to a full recovery.

A patient with a brain injury could receive the best care in the world; however, a crucial aspect to recovering from a brain injury is family support. A brain injury is a life changing event for not only the patient, but for their entire family and friends. Depending on the severity of the brain injury, some people may never return to work. In these cases, sometimes a father of a family of four can no longer support his family. Often times, older parents become the caregivers of their adult children. This is why family support is crucial for recovery.

Advocate Lutheran General Hospital (LGH), located in Park Ridge, Illinois, is a Level I Trauma Center and annually treats about 500 patients with brain injuries ranging from minor concussions to severe brain injuries. Patients with severe traumatic brain injury are usually admitted to the Surgical Intensive Care unit, and once

they are medically stable, immediately begin their rehabilitation. Lutheran General's expert Trauma Acute Care Rehab Team ensures the patient receives therapy services throughout their entire stay at the hospital. LGH also has an inpatient rehabilitation unit that has therapists trained in working with patients with severe brain injury. There is a treatment room that allows patients with attention difficulties to focus on their therapy in a quiet and private environment to help achieve improved concentration. LGH also offers a brain injury support group on the third Saturday of every month. The focus of the group is to allow patients with a brain injury and their families to come together and share their stories and struggles in a safe and relaxed environment. For more information on the LGH Brain Injury Support Group, please call (847) 723-6690. For more information on brain injuries, please refer to The Brain Injury Association of America, www.biausa.org.

TBI Progesterone Study Enrolling Patients

by Tammy Chatman, CMTE
Professional Relations/Marketing Manager
McHenry Base

Approximately 1.5 million Americans per year suffer a traumatic brain injury (TBI) resulting in 50,000 deaths, 235,000 hospitalizations and 80,000 cases of long-term disability. Incidence of TBI in all industrialized countries is comparable to that in the U.S., with estimates ranging from 150 to more than 300 brain injuries per 100,000 people. There are approximately 66,000 deaths annually attributed to TBI in Europe.

The leading cause of TBI in the world is road traffic accidents, accounting for 40-50 percent of the hospitalizations for TBI.

Currently, there are no approved medications to improve outcomes following TBI. The SynAPSe study is a Phase III multi-national clinical trial that will include just under 1,200 patients. It is based on promising results achieved in several previous clinical trials demonstrating a mortality benefit as well as improved functional outcomes in TBI patients treated with progesterone.

Advocate Lutheran General Hospital (LGH) in Park Ridge, Illinois, is very excited to be one of the approximately 100 clinical sites for this international trial. Advocate LGH's SICU and ED will be participating in a Phase III clinical trial to determine if a continuous five day progesterone infusion improves neurological outcomes in the TBI patient.

Dr. Shaun O'Leary is the primary investigator (PI) for the trial. LGH has a fairly large percentage of trauma patients that sustain permanent blunt TBI. According to Dr. O'Leary, "This is a very well designed study that will cover a wide cross section of patients. It has shown great promise in the pre-clinical studies, and the medication has been proven to be relatively safe and easy to use."

In Phase III trials, the experimental study drug or treatment is given to large groups of people (1,000 – 3,000) to confirm its effectiveness, monitor side effects, compare it to commonly used treatments, and collect information that will allow the experimental drug or treatment to

continued on page 10

MEDICAL DIRECTOR'S CORNER: Managing Traumatic Brain Injuries

by M. Riccardo Colella, DO
Chief Medical Officer & Medical Director
FLIGHT FOR LIFE Transport System

The pathophysiology of Traumatic Brain Injury (TBI) is conceptualized as two types of injury: primary and secondary. Primary brain injury occurs because of direct impact, rapid acceleration/deceleration, and penetrating or blast injuries at the initial time of injury. The damage that results includes a combination of focal contusions and hematomas, as well as shearing of white matter tracts (diffuse axonal injury) along with cerebral edema and swelling.

Secondary brain injury in TBI is a cascade of molecular injury mechanisms that occur at the time of initial trauma and may continue for hours or days. These may lead, in turn, to neuronal cell death as well as to cerebral edema and increased intracranial pressure that can further exacerbate the brain injury.

Because of primary and secondary types of TBI, emergency service providers frequently encounter a range of behavior from patients who suffer TBI, from apathy to combativeness to unresponsiveness. Other factors such as pain, anxiety, and good old fashioned alcohol contribute to the combative behavior that make caring for a TBI patient a challenge for health care providers. Attempting to differentiate the causes of combativeness in a trauma patient is complex, especially in the austere pre-hospital environment, which lacks the resources of a trauma center. A systematic approach to the trauma patient is crucial to ensure proper assessment of all injuries and prevention of hypotension and hypoxia, two factors known to worsen the secondary insult of TBI.

In the context of managing combativeness in a patient with TBI, balancing sedation with avoidance of worsening injury may prove challenging but should be the basis for the individual approach necessary to optimize the best possible outcome. Analgesics, sedatives, and other agents are frequently used with the rationale that sedation may lower ICP by reducing the metabolic demands and sympathetic response that arise after injury. While their use has been a cornerstone of ICU care for decades, the scientific literature of their true efficacy remains unclear for many agents. Furthermore, these medications unfortunately have the potential to cause hypoxia, hypotension and vasodilation, which will increase intracranial pressure and worsen outcome.

National guidelines advocate that patients with signs of severe traumatic brain injury (GCS \leq 8) undergo neuro-protective rapid sequence intubation by the most skilled provider for optimized oxygenation (avoid hypoxia),

ventilation (avoid hyper/hypocapnia), and aspiration protection. Bypassing a community emergency department in lieu of direct field transport to a Level I trauma center is associated with best outcomes. Stable combative patients with mild (GCS 15-14) to moderate (GCS 13-9) TBI, however, prove to be the most challenging for EMS providers. Anyone who has ever cared for a combative head injury patient in a moving ambulance or helicopter can attest that patient and provider safety are critical. In addition to passive therapy, such as stimulation reduction (voice tone, cabin lighting, sirens), short acting pharmacologic agents should be available to ensure safe sedation and transport while avoiding the side effects of hypoxia and hypotension. Unfortunately, no one protocol addresses all scenarios EMS providers encounter, but a clear focus on mitigating secondary insult should be the guiding principle for managing TBI.

Pink Heals Sales Benefit Local Women With Cancer

by Kathy Mitchell, Marketing Coordinator
FLIGHT FOR LIFE Transport System

As sales of Flight For Life/Pink Heals logo items wound down, preparations began to present the profits to each bases' chosen charity that cares for women who are battling cancer.



McHenry Base check presentation to Centegra Sage Cancer Center

Flight For Life-McHenry Base presented a check to the Centegra Sage Cancer Center on February 14th. Part of the money will go toward a replacement support arm for the Strut-Assisted Volumetric Implant (SAVI) device used in multiple types of cancer treatment. The support arm provides greater comfort to the patient and increased accuracy for the physician during treatment. The remainder of the money will go into a fund to provide massages for women who are battling cancer who could not otherwise afford this very comforting and therapeutic treatment.

continued on page 11

CREW VOLUNTEER & COMMUNITY SERVICE NEWS: Making a Difference in a World Far Away

by Rebecca Schwuchow, RN, Flight Nurse
Waukesha/Milwaukee and McHenry Bases

In the fall of last year, I had the opportunity to travel to Tanzania on a medical humanitarian trip with the organization Aid Africa's Children. This was my fifth trip to



Africa and my first to Tanzania. On these trips, we provide food, training, supplies and crisis intervention in several countries in Africa. I traveled with an amazing group of people, consisting of Dr. Ed Shackelford, an Emergency Medicine physician, and Dr. Diane Gerlach, a pediatrician, both from Aurora Medical Center – Kenosha; Kerrie Newman, an EMT from the Town of Salem Fire and Rescue; Debbie Gilliam, a Registered Nurse from Heart and Vascular of Lake County, Illinois; Laura Balmes, former Flight For Life Communication Specialist; Kelsey Schwuchow, a high school senior; and Dr. Charles and Diane Malege of Palatine, Illinois. We traveled to Musoma, Tanzania, where we split into two groups.

One group worked with two local doctors at a dispensary in Tarime, Tanzania. The very first patient they cared for was a mother who delivered a healthy baby boy just minutes after their arrival. Patients would line up and wait all day long to receive medical care. The other group traveled to a dispensary located in a remote area called Baraki. Critically ill children were the primary focus for the group in Baraki. We cared for a 9-month-old female who presented unresponsive with a hemoglobin of 4, which was caused by malaria.

Malaria is the leading cause of death in Tanzania for children under the age of five. We were unable to initiate an IV, so we inserted a feeding tube and taught the staff how to give a hydration solution through the tube. She

was one of the fortunate patients who survived her bout of malaria; others were not so blessed. Many women presented to the clinic with chronic low back and neck pain from carrying water and heavy bundles on their heads, and carrying their babies on their backs. While at the Baraki dispensary, we piled into a vehicle that served as an ambulance, driving on cow paths that served as roads to remote areas. We held clinics in a borrowed home and under trees; people waited for hours in the hot sun to be evaluated. I was impressed with the care given by the local providers. We brought a microscope with us on our remote clinic days and were able to obtain basic diagnostic tests.

We have received a formal request from the Tanzania Regional Minister of Health to return and provide education to the local health care providers; we plan to do this in the fall of this year. I am always moved by the spirit of the people I meet. The mother of the 9-month-old offered me some of her porridge while I was caring for her child. This was certainly her only meal of the day, and it had probably been given to her by someone who lived near the clinic. I was so overcome and moved by her generosity, I was speechless. On the last day at the clinic, when her daughter was being discharged, she gave one of our volunteers a chicken! We had to explain that the chicken would never make it past customs!

It is always a privilege to serve in Africa, and I look forward to the fall when I will have the opportunity again. You can find out more information about Aid Africa's Children at our website: www.aidafricaschildren.org.

Photos from WEMSA – January 2011



WHERE ARE THEY NOW? A PATIENT UPDATE: Brad Caddock

by Claire Rayford, RN
Professional Relations/Marketing Manager
Waukesha/Milwaukee Base

At a recent conference, while staffing the Flight For Life (FFL) booth, I noticed a gentleman staring intently at the helicopter. Walking over to see if he had any questions about Flight For Life, he replied that he had once been a FFL patient! We then entered into a discussion about his amazing story, which he willingly agreed to share with everyone – so here it is!

On a brisk January evening in 1993, Brad Caddock and his brother decided to go skiing at Sunburst Ski Hill in Kewaskum. At that time, Brad was a high school junior and active in a variety of sports, including cross-country, track, and skiing. He was also in an early entry program for a military career and had just attended his first meeting. Little did he know that his life's path was going to take an abrupt turn.



Brad Caddock on a recent visit to the Flight For Life – Waukesha/Milwaukee Base

While going down a ski run with his brother and a few friends, Brad was struck full force by an “out-of-control” skier who was coming down an adjacent advanced ski run. He was flung 20-25 feet, landing on his head on the frozen ground under the snow pack. Although he was initially conscious, the following circumstances were primarily recounted from his brother and others at the scene, and his caregivers.

Brad had sustained a depressed skull fracture – with some significant loss of blood at the scene – as well as a fractured forearm. Flight For Life was called to transport him to Froedtert Hospital; his family was told that he had only a 3-5% chance to survive his injuries. Beyond that, his prognosis to return to a “normal” lifestyle was uncertain. He was immediately taken to the operating room to repair his skull fracture, and was kept in a drug-induced



Jim Kozuta, (left) Brad's Flight For Life pilot, and Brad, reunited

coma and under heavy sedation/restraints for five days post-op to allow his brain some time to heal.

When his clinicians brought him out of the coma, Brad became aware that he could not feel his left leg or move it at all. Multiple diagnostic tests were given to determine the source of the problem. Was it related to his injured brain or some other unrelated, undiscovered problem? After a battery of x-rays, CAT scans, and MRIs, a ruptured disc was found in the lumbo-sacral area of his spine. A therapist cautioned Brad, “You may never walk again.” One day later, Brad underwent surgery; post-operatively, he was immediately able to move his left leg, but could not yet stand up for several more days because his blood pressure dropped when positioned upright.

In Brad's words: “When I was able to get up and walk for the very first time, I had to think about each step I took, and how to move my leg to go about 15 feet.” Miraculously, although he did not recall anything after being struck on the ski hill, his other cognitive functions were intact except for some short term memory loss. After a three-week stay at Froedtert – one week in intensive care and two weeks on the neurological unit rehabilitation floor – Brad was discharged to Community Memorial Hospital in Menomonee Falls for additional aggressive rehab therapy. He recalls that, at age 17, he was by far the youngest person in rehab, with his closest floor mate in the fifties. He remained there for one week, with intensive evaluations by physical and occupational therapists – assessing his cognitive performance and ability to execute ADLs (“Activities of Daily Living”).

At the end of February, Brad went home to continue his road to recovery. Outpatient therapy continued, as well as initiating four hours per day of class work to begin inserting himself back into the school curriculum. He not only had to catch up with the school work that he had missed since his hospitalization, but his brain was continuing to heal; he had to follow a very structured

continued on page 10

COMMUNICATORS' CORNER:

We're Already on the Way!

by Chris Forncrook, Lead Communication Specialist
FLIGHT FOR LIFE Transport System

Our Flight For Life Communications Center is constantly buzzing with activity. Communication Specialists continuously monitor radio scanner traffic from the Fox Valley to the northern Chicago suburbs in an effort to anticipate the needs of our customers. There have been numerous occasions when the on-duty Communication Specialist has heard referring agencies calling for a helicopter in the early stages and activated crews prior to receiving the official request. The ability to answer these types of requests with "I was monitoring your radio traffic and we're already on the way" is a service we are proud to offer. This practice also saves precious minutes, allowing the flight team to check weather, move the aircraft outside, gather equipment and O-Negative Blood and prepare for the mission.

I would like to extend this proactive approach to our partners in emergency dispatch. As the first point of contact in an emergency, information received during the 911 calls can be used to determine the seriousness of the incident. Key words or phrases such as: "patient is trapped" or "patient was thrown from the vehicle" are indicators of a major incident. The patient's condition might indicate the necessity for air medical transport. We encourage dispatch centers to work with their agencies in developing procedures that allow dispatchers to contact Flight For Life for these types of incidents, enabling early anticipation of patient's needs in a tiered response. This process could be a simple prompt from the dispatcher to responding agencies that "based on the information received, would you like me to contact Flight For Life?" A more detailed procedure may be an option that allows for simultaneous dispatching of Flight For Life based on a predetermined set of criteria.

Whichever procedure the dispatch center and its agencies choose, the goal should be to link persons with illness or injury to resources which provide optimum in medical care and outcomes. Activating these resources as soon as the need is identified helps achieve this goal, reducing patient morbidity and mortality.

If you are interested in seeing our Communications Center in action, we offer a Communications Center Observational Experience (CCOE). This experience allows individuals to spend 4 to 8 hours in our state of the art facility side by side with our Communication Specialist. The program was developed for public safety dispatchers, but is open to all emergency responders. It is a great opportunity to see our process from start to finish and learn a great deal about Flight For Life while having some fun. Information for participating in the CCOE is on our website at: www.flightforlife.org.

FROM THE PILOTS' PERSPECTIVE: A Flash in the Night

by Janis Sierra, Lead Pilot
Waukesha/Milwaukee Base

It's a warm summer evening and you're enjoying a barbeque with friends. One of those friends brings out a laser pointer. The friend starts pointing at various objects around the yard when he sees aircraft lights in the night sky. The friend points the laser at the aircraft and "tracks" it.

Good idea or bad? In fact, it's a very bad idea. It's illegal. Shining a laser at aircraft is a punishable offense that could involve a fine or, in severe cases, incarceration. While no incidents have been linked to terrorism, security officials are concerned terrorists may use lasers to incapacitate pilots. Currently, law enforcement may use Federal Aviation Regulation Part 91.11 which is titled "Prohibition on interference with crewmembers" to cite offenders.

With the advent of easily accessible, relatively inexpensive, hand-held laser devices, the incidence of aircraft laser illumination has increased dramatically in recent years.

In December 2010, one of our own aircraft was "tagged" with a laser. Exposure to laser light could result in glare, flash blindness and/or after-image. In extreme cases, retinal burn can cause permanent physical damage to the eye. Glare is when a laser light obscures an object near the same line of sight. Flash Blindness is a temporary loss of vision after exposure to a laser light that gradually fades after the laser light source has been removed. After Image is a temporary image similar to what you see after a bright camera flash. Distraction, distortion and discomfort can accompany a laser illumination event, which may lead to a hazardous situation for the pilot and flight crew.



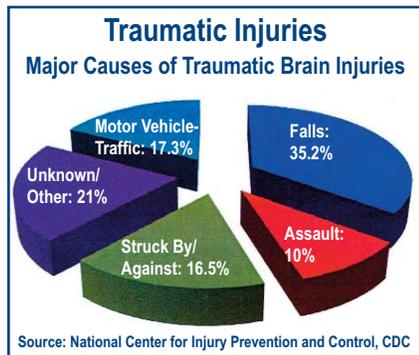
What may have seemed like an innocent pastime could potentially cause great harm. If you are witness to an aircraft laser illumination event, please report it to your nearest law enforcement, contact your dispatch center, or notify the Flight For Life Communications Center at 800-344-1000. You can also go online to: www.faa.gov/regulations and look for AC 70-2 Reporting of Laser Illumination of Aircraft, or e-mail LaserReports@faa.gov.

Traumatic Brain Injuries

(continued from page 2)

the time of injury. Often, a problem is discovered at a later point in time as the patient attempts to carry on with normal daily actions or has problems with cognitive or physical abilities.

Phan reports that TBI is the leading cause of death in North America for individuals between the ages of 1 to 45, and the economic impact is estimated to be 9.2 billion dollars in lifetime medical cost.⁴ Phan goes on to illustrate that the primary goal of pre-hospital management for severe head injury is to prevent hypo-tension and hypoxia. If these two areas are not managed quickly, secondary injury will soon result. **Secondary injuries are the development of further neurological damage after the primary injury; these injuries are not always avoidable but, at times, the initial management of a TBI patient can have a significant, if not the most crucial, impact on the patient's outcome.**



Initial Management Recommendations⁵

- Early airway management and prevention of hypoxia is a priority. Utilizing an advanced airway is also recommended if the Glasgow Coma Scale (GCS) is 8 or less, or provider judgment anticipates the need to secure the airway. Intubation should be done by an experienced provider and hypoxia avoided. If the intubation appears to be difficult or prolonged, it should be avoided and the airway maintained with non-visualized advanced airways or basic adjuncts. Prolonged intubation attempts have proven to result in a 4-fold increase in mortality rates of TBI patients due to hypercarbia and hypoxia. **Stiver reports that patients with a TBI and ETCO₂ readings consistently of 30-39mm/Hg have a mortality rate of 21%. Patients outside the 30-39 reading have a mortality rate of 34%.**
- Increased CO₂ results in vasodilation and increased vascular wall tension. This may lead to increased blood flow to the brain and increased ICP. It is crucial to maintain an ETCO₂ reading of 30-39 mmHg.
- An initial GCS should be identified and communicated to determine severity. Deterioration can quickly be identified throughout patient care using the initial GCS as a benchmark.
- Adequate fluid resuscitation is necessary to avoid hypotension. Hypotension will decrease the ability for normal brain perfusion to occur. The patient's

Pathophysiology of a TBI

Transfer of energy from a fixed or moving object resulting in brain tissue damage.

Results in an open or closed injury to the skull and/or brain.

Normal Intracranial pressure (ICP) is 5-15 mmHg.

Due to the injury to the brain and resulting hemorrhage, the ICP increases causing compression to brain tissue within the cranial vault. At times, the pressure is so high the brain itself is forced to shift or herniate.

As the pressure rises within the skull, the functional portions of the brain become hypoxic due to the pressure applied, reducing the amount of blood flow to these functional tissues. The brain triggers the cardiovascular system to increase the blood flow to the brain and respiratory system to reduce the amount of carbon dioxide by stimulating irregular respiratory patterns. The true emergency is not lack of blood flow, it is too much pressure. The response of these two systems is needed, but within reason. As the systemic response endures, the ICP increases, which increases the hypoxic area(s). If intervention is not initiated, the brain herniates, typically resulting in a fatal outcome.

Interventions:

- Identify TBI's early
- Support ABC's aggressively
- Maintain normal glucose levels
- Maintain head in neutral position, elevated approximately 30°
- Maintain CO₂ levels at 30-35mmHg
- Manage hypotension aggressively. Hypertension below a SBP of 250mmHg is permitted.
- Control seizures
- Administer Mannitol when signs of herniation exist – seizures, unequal pupils

head should be placed in a neutral, midline position and the head of bed elevated to approximately 30 degrees. This will allow gravity to assist with normal return of blood flow. This does not preclude TBI patients from being placed on a long board.

- Sedation is needed for combative patients. When combative, a patient can increase their ICP due to the physical activity and stress involved.
- Versed should be used with caution as it can cause hypotension.
- Etomidate is typically hemodynamically neutral. A dose of 0.15mg/kg has an onset time of 15-45 seconds, and is a good choice for sedation, but has a shorter duration of action of 3-12 minutes.
- Ketamine is also a good choice. Ketamine preserves respiratory drive, has a quick onset and offers analgesic properties. Although Ketamine can cause a sympathetic reaction, potentially increasing ICP, it may be a good choice in hypotensive patients; studies directly measuring intracranial pressure in patients receiving Ketamine do not demonstrate an increase in ICP.
- Paralytics should be utilized for patients that require paralysis if sedation is not sufficient. The duration of paralysis should be considered when selecting a paralytic to administer (long lasting versus shorter lasting) and factors such as time to definitive evaluation should guide the choice of agents. Paralytic

continued on page 9

Traumatic Brain Injuries

(continued from page 8)

medications might delay a detailed neurologic exam once the patient arrives at the hospital, but may be necessary to optimize ventilation and ICP in the pre-hospital transport phase. As the effect of paralytics and sedatives decrease, the caregiver should constantly reassess the patient, identifying the return of physical signs, including tearing and slight physical movements.

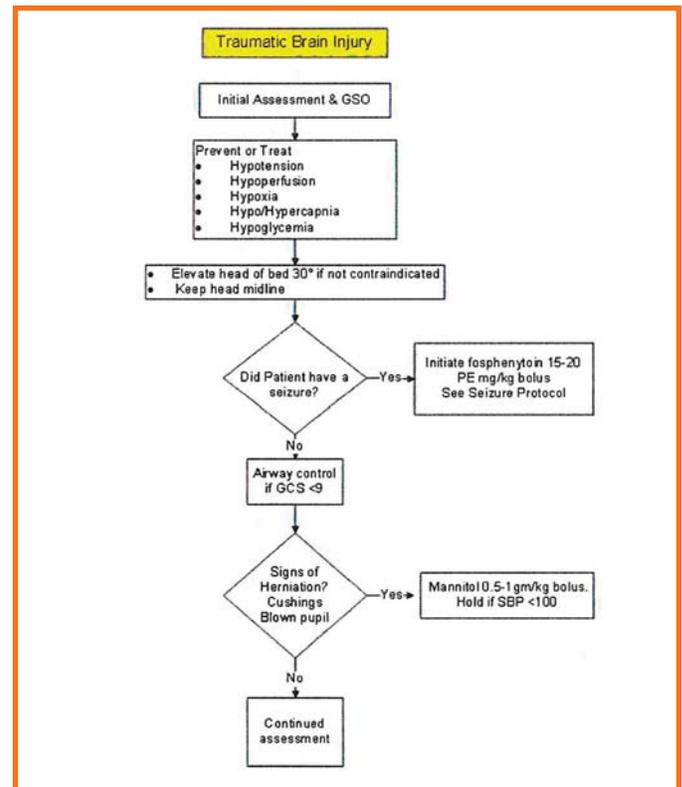
Management and Outcome

TBI patients can be difficult to manage. Airway maintenance, IV access, combativeness, and blood loss can all simultaneously present the provider with a stressful situation. A positive patient outcome is enhanced when providers understand and are current in patient care modalities that include up-to-date evidence-based treatments. A systematic approach from all providers that interact efficiently and effectively will improve patient care. At right is one part of FFL's protocol for treating TBI.⁶ All clinical information presented is a guideline only. Consult your medical protocols.

In this particular case review, the FFL team made decisions regarding medication administration prior to air medical transport based on the following information:

- The EMS report indicated that sedation and paralytics were administered a minute or two prior to the FFL team entering the ambulance.
- The dosage administered was more than sufficient for the patient.
- EMS approach to patient care, and clinical interventions and report provided, were indicative of an experienced care-provider team.
- It was a 10-minute flight to the Level I Trauma Center. Additional paralytics administered without a reasonable indication for use could delay the ability of the neurological team to perform a prompt assessment, increasing the time to make a definitive clinical diagnosis and plan of care for patient management.
- In the ambulance and during the transfer to the helicopter, there was no evidence of the medications' effect diminishing.
- After reviewing the ETCO₂ waveform strips, the patient did not exhibit any signs of spontaneous breathing until after he was loaded into the helicopter.

The patient was admitted and diagnosed with a moderate TBI. The course of action was to monitor ICP while sedated and reduce the ICP slowly over the upcoming days. When this outcome was achieved, rehabilitation was the next step, following a neurological evaluation to identify the amount of damage that had occurred to the brain.



Sample Protocol, Reference⁶

Conclusion

This case review provides a great illustration of the many facets of pre-hospital care for these critically injured patients. Adhering to the guidelines of Basic Life Support (BLS) measures often provide the most supportive care for TBI patients in the pre-hospital environment. Simple steps such as keeping the head midline, raising the patient's head to approximately 30 degrees, and providing high flow oxygen are significant interventions, in addition to transporting the patient to the appropriate facility. Advanced Life Support (ALS) plays an important role in cases when the TBI patient requires advanced airway procedures and medications to decrease rising ICP and reduce the probability of secondary injuries. The receiving facility staff, based on a good pre-hospital report, can identify the level of injury and proceed with measures to include close monitoring of the ICP, utilizing GCS changes and/or ICP monitors, which are typically surgically introduced and referred to as a "bolt." The goal is to maintain an ICP below 20 mmHg. During the following days and weeks of therapy, these patients are kept sedated and the head elevated to maximize venous return from the head to the body and lower extremities. Some TBI patients require urgent, more advanced interventions, including craniectomy, which is surgically removing a portion of the skull for a period of time to allow the ICP to decrease, avoiding herniation.⁵

Allocation of resources and aggressive pre-hospital management of the TBI patient determines their outcome. Positive clinical results can occur based on the

continued on page 10

TBI Progesterone Study

(continued from page 3)

be used safely. Within 20 months, Dr. O'Leary hopes to have 12 patients in this randomized, prospective study that meet the strict inclusion criteria. He and his team will follow these patients for six months post injury. (Note: Patients will continue to receive all standard of care TBI management in addition to the infusion.)

Why was progesterone chosen as the study drug? Based on a large and growing body of pre-clinical evidence, it is believed that progesterone demonstrates potentially powerful, neuroprotective properties, with few side effects, in males and females. It has also been shown to reduce post injury edema in rats, as well as improve cognitive recovery and secondary neuronal loss caused by contusion injury.

Inclusion criteria for patients are as follows:

- Glasgow Coma Score of 4-8 after resuscitation
- Weight 45-135 kgs
- Male or female between the ages of 16-70
- TBI diagnosis by history and clinical examination
- Minimum one reactive pupil
- Indication for ICP monitoring

Exclusion criteria for patients are as follows:

- Prolonged and/or uncorrectable hypoxia (PaO₂ < 60 mmHg) or hypotension (SBP < 90 mmHg) upon admission
- Any spinal cord injury
- Pregnancy
- Life expectancy < 24 hours as determined by PI
- Penetrating head injury
- Bilaterally fixed dilated pupils at the time of randomization
- Coma suspected to be primarily due to other causes (e.g. alcohol)
- Pure epidural hematoma
- Pre-existing clinically significant disease or chronic condition ascertained at the time of admission that could affect functional outcome
- Severe cardiac or hemodynamic instability after resuscitation
- Known treatment with another investigation drug therapy
- History of allergic reaction to progesterone and related drugs or any components of the infusion
- Any disease in the opinion of the PI that is unstable or which could jeopardize the safety of the patient and his/her compliance in the study
- Subjects who, in the opinion of the PI, would not be able or willing to comply with the protocol through the final visit (6 months post injury)

In addition to the strict inclusion/exclusion criteria, enrollment may be limited by the fact that the study requires written consent from next of kin, who must be present for a signed consent. Also, the drug must be started within eight hours of injury. Therefore, prompt arrival to LGH is of the essence to assist in determining if the patient meets criteria and to attempt to contact family members to obtain consent. It would be optimal if the patients were admitted directly from the field/scene to avoid transfer delays. However, LGH will continue to work closely with their Region Level II's to expedite trauma transfers for Level I care.

Flight For Life will be following up with Dr. O'Leary and his team in the fall to provide an update on how the trial enrollments are proceeding.

Traumatic Brain Injuries

(continued from page 9)

applied knowledge, skill and interventional abilities of those providing care. Being one step ahead of the patient's current condition is crucial.

References

- ¹ EMT's, N. A. (2007). Pre-Hospital Trauma Life Support, 6th Edition. St. Louis: Mosby.
- ² Lenrow, D. (2006). Understanding traumatic brain injury. Retrieved October 11, 2010, from <http://www.traumaticbraininjury.com/content/understandingtbi/whatistbi.html>
- ³ Centers For Disease Control. Emergency Preparedness and Response. Retrieved April 2, 2011, from <http://www.bt.cdc.gov/>
- ⁴ Phan, N., & Hemphill, J. (2010). Management of acute severe traumatic brain injury. Retrieved December 11, 2010, from <http://www.uptodate.com/patients/content/>
- ⁵ Stiver, S. & Manley, G. (2008). Prehospital management of traumatic brain injury. Neurosurgical Focus. 25(4). Retrieved December 11, 2010, from <http://www.Medscape.com/viewarticle/585165>
- ⁶ Flight For Life Standards & Practice Committee, (2009). Part of Flight For Life's Traumatic Brain Injury Protocol.

**FLIGHT FOR LIFE received a
2010 Vision Zero Honorable Mention
because of the program's
commitment to safety
and contributions to the industry**

Brad Caddock

(continued from page 6)

schedule of lessons to "make up" classes while he was continuing with his rehabilitation. Brad had a great variety of tutors to work with and, with dogged perseverance and a commitment to achieve complete recovery, he was able to graduate with his senior class! Brad smiled when he said that he was honored to be named Senior Captain in his three favorite sports along the journey!

Unfortunately, his injuries made him medically ineligible to continue on in his goal towards a military career. But Brad discovered that he enjoyed classes in Criminal Justice and, upon graduation, began work full time with the Brown Deer Police Department. He became a Crime Prevention Officer in 2000, and has enjoyed working with a "new" canine partner – a Dutch shepherd named "Justis" – in 2008.

Flight For Life was just a small link in the chain of survival for Brad. His story of survival and recovery is an example to everyone how important family, friends, and personal motivation is to turn tragedy into triumph for those who persist to achieve their goals.

Pink Heals

(continued from page 4)



Waukesha/Milwaukee Base check presentation to the Wisconsin Ovarian Cancer Alliance (WOCA)

Flight For Life-Waukesha/Milwaukee Base presented a check to the Wisconsin Ovarian Cancer Alliance (WOCA) on April 18th. The WOCA will use the money to support critical outreach education efforts regarding “the disease that whispers” – promoting knowledge about key early warning symptoms women and clinicians should know. In addition, to directly benefit local area families who are either struggling with this disease or who are part of the ovarian cancer survivor network, a portion of the donation will go towards providing women with therapeutic massages and family fun Brewer tickets.

Flight For Life-Fond du Lac Base will present a check to the Central Wisconsin Cancer Center in Fond du Lac this summer.

PR Reminders for our Customers

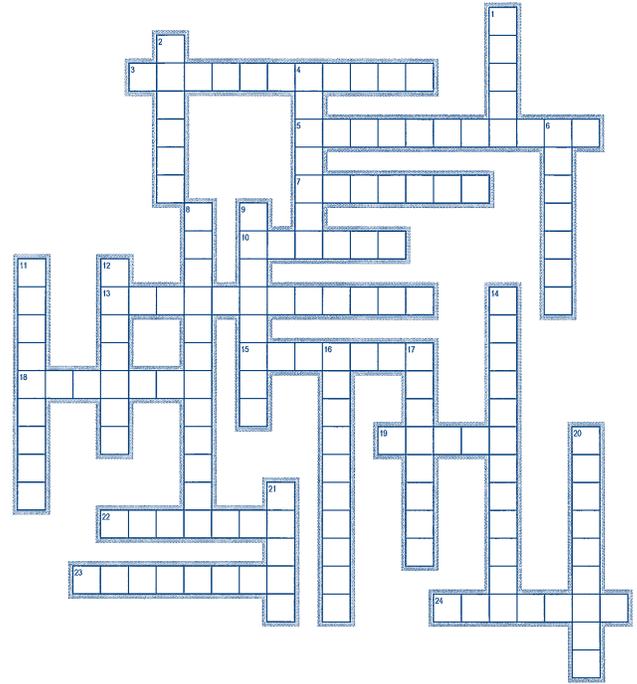
Each Fire Department/Rescue Squad may request any/all of the following training PRs: Safety Inservice, Mock Scene, Pre-Prom, Disaster Drill, Mass Casualty Drill, Educational Lecture, Case Review, Hangar Tour, or National Night Out (sometimes requested by Law Enforcement)

In addition to the above, each department may have one non-training PR each year, such as, but not limited to: open house or anniversary event, fundraising event (pig roast, pancake breakfast, etc.), or local school event.

Fire Departments/Rescue Squads must have had a FFL Safety Inservice within the past two years in order to have the helicopter come for a non-training event. If the department is not current with this training, they must have an inservice before the non-training PR is held.

continued on page 12

Blunt Trauma Crossword Puzzle



ACROSS

3. In the acronym DCAPBTLS, P stands for _____.
5. Similar to placing an organ on a table and hitting with a hammer.
7. After a blast or explosion it is very common to have a loss of _____.
10. Illinois does not require the use of this item.
13. Vehicles such as snowmobiles, waverunners, and ATVs
15. A body in motion will remain in motion unless acted upon by this outside source.
18. In an explosion, hollow organs are susceptible to _____.
19. Emphasizes the importance of rate at which an object changes speed.
22. This type of collision causes 22% of all traffic deaths.
23. Fractures to femurs, pelvis and head are common to what type of pedestrian?
24. This type of energy in motion.(this type of energy is due to motion)

DOWN

1. In the acronym DCAPBTLS, B stands for _____.
2. When we have a fall victim, you need to consider the _____.
4. More than 50% of all fatal crashes involve the use of this.
6. An explosion happens when there is fuel and an _____ that combines and instantaneously ignites.
8. Similar to hitting a closed paper bag.
9. Organs and the attachments do not accelerate or decelerate at the same rate of speed.
11. In the acronym DCAPBTLS, D stands for _____.
12. This type of crash causes an occupant to go down and under.
14. Mass x _____ = Force
16. Right/left or front/back crash type.
17. The force that puts the object in motion must be _____ before the object will stop.
20. When part of the vehicle has been pushed into the occupants space it is called _____.

see answers on page 12

