Annex L – HUMAN EFFECTS OF MILD, NON-LETHAL TRAUMA

1) The importance of defining terms when assessing the effects of mild trauma is illustrated in an article by Elliot J. Pellman (Pellman 2003). Dr. Pellman wrote:

"In 1994, as the associate team physician and internist for the New York Jets, I was responsible for the diagnosis and treatment of concussions. I had been with the New York Jets since 1987, having trained as an internist and rheumatologist. Although published information existed, most of what I, like other team physicians, knew about concussions was from on-field anecdotes passed on from other team physicians and athletic trainers who had been treating professional football players for many years. During my years of medical school, internal medicine training (including an extra year as chief medical resident), and fellowship, from 1975 to 1986, I had never received a single lecture on concussions. As I learned later, this was typical of physician training for what was then an often under-diagnosed and little-understood clinical condition.

Al Toon, a Pro Bowl receiver for the New York Jets, had been with the team since 1985, after playing college football at the University of Wisconsin. As a player for the New York Jets, Mr. Toon was recognized as one of the finest receivers in the National Football League. From the beginning of his professional career, Mr. Toon began to incur what we now recognize as concussions. These dings, as they were referred to then, were minor, often causing no more than mild headaches and some dizziness. Unrecognized by everyone, including me, these concussions began to worsen in the later years of his career. Mr. Toon began to experience severe headaches, malaise, intolerance of loud noises, depression, and emotional labiality after what were viewed as mild, inconsequential blows to the head. Mr. Toon was experiencing what we now call post-concussion syndrome, which would eventually lead to the premature retirement of this great athlete in 1992. He was the first documented NFL player that I know of to retire as a result of this problem.

Mr. Toon's retirement, which received some attention in the public news media but none in the medical world, was overshadowed by the injury to Dennis Byrd, a defensive lineman who sustained a fracture of the cervical spine while also playing for the Jets. It was not until the following year, when another NFL player, Merrill Hoge, a player for the Pittsburgh Steelers, was also forced to retire because of post-concussion syndrome, that both medical personnel and football executives took notice. Shortly after the retirement of Mr. Hoge, NFL Commissioner Paul Tagliabue began to inquire about this medical issue. On the basis of my experience with Mr. Toon, I was invited to the Commissioner's office to offer my limited insight into this problem. The Commissioner and I realized that we had many, many more questions than answers. Was this a new problem or just an often misdiagnosed or unrecognized one? Was the premature retirement of these men a statistical anomaly or the beginning of an epidemic? I was asked to mount an effort to answer these questions.

During my treatment of Mr. Toon, I quickly realized how few experts and how little prospective, scientific medical information were available regarding concussions. I decided that a novel approach would be necessary to gather information, particularly for a professional sports league, and with the encouragement and support of Commissioner Tagliabue, in 1994 I formed the NFL Committee on Mild Traumatic Brain Injury. This committee was composed of experts from inside and outside the NFL, consisting of team physicians, team athletic trainers, a team

equipment manager, a neurologist who had considerable previous clinical experience with boxers, a neurosurgeon who had experience in treating NASCAR drivers, a neuropsychologist who was a pioneer in using neuropsychological testing to evaluate athletes, a biomechanical engineer to help us understand safety equipment, and an epidemiologist.

It became apparent to the committee that there was no single accepted definition of concussion and that, if we were to begin asking questions regarding the problem, we would need a single definition that would be used league-wide by the medical staffs of all the teams. The first several months of meetings were dedicated to defining concussion, or as we quickly decided, the more academically appropriate term, mild traumatic brain injury, which is more commonly referred to as MTBI. After a great deal of discussion, we decided that our definition would be broad, realizing that we would rather over-identify injuries than potentially exclude milder ones. A reportable MTBI was defined as a traumatically induced alteration in brain function that is manifested by 1) alteration of awareness or consciousness, including but not limited to loss of consciousness, ding, sensation of being dazed or stunned, sensation of wooziness or fogginess, seizure, or amnesic period; and 2) signs and symptoms commonly associated with post-concussion syndrome, including persistent headaches, vertigo, light-headedness, loss of balance, unsteadiness, syncope, near-syncope, cognitive dysfunction, memory disturbance, hearing loss, tinnitus, blurred vision, diplopic, visual loss, personality change, drowsiness, lethargy, fatigue, and inability to perform usual daily activities.

Once there was agreement on the definition of MTBI, we quickly realized that the first order of business was to gather information, in the knowledge that this would need to be a meticulous and lengthy process, and to educate and sensitize the League's medical and coaching staff to this medical problem. With the help of the epidemiologist on the committee, we devised a questionnaire that team physicians and trainers would be required to fill out after a player sustained an MTBI. A memo was sent to the physicians, athletic trainers, and team executives by the Commissioner emphasizing the importance of this information and mandating compliance in filling out these detailed forms.

After there was agreement on the form and a basis for collecting MTBI data, the committee decided to begin to examine the available safety equipment. Many team physicians had similar experiences with regard to the sales personnel of helmet manufacturers, who made claims about helmets and their potential to decrease the risk of MTBI. Players and medical staff were told to increase the air in the inflatable bladders in the helmets or to change the type of helmet to reduce the risk of MTBI. When manufacturers were invited to present the scientific data to support these claims, it became apparent to the committee members that these claims were not based on scientific data but rather were sales pitches made by over zealous salespeople.

Contacts with representatives and biomechanical engineers of the National Operating Committee on Standards for Athletic Equipment additionally made it obvious to the committee that the testing methods used to quantify football helmet head protection were unable to predict the amount of protection afforded to prevent MTBI. Furthermore, this lack of understanding of the physics and biomechanics of the injury was retarding helmet manufacturers from making changes to helmets that could lead to greater MTBI protection.

After lengthy discussion and many committee meetings, it was decided that the committee would recommend to Commissioner Tagliabue that the NFL should independently fund scientific

research that would enable scientists to better understand the cause(s) of MTBI; that this research should be funded to independent scientific researchers; and that the NFL Mild Traumatic Brain Injury Committee should be charged with oversight of the project. It was also decided that all research results would be given to the National Operating Committee on Standards for Athletic Equipment, to helmet manufacturers, and to as many researchers and clinicians as possible in an attempt to promote a better understanding of MTBI and methods that might, directly and indirectly, prevent and treat these injuries.

From the current perspective, the enormous investment in research on MTBI is paying dividends in an improved understanding of the causes and prevention of the injury. Although much more research is needed, the results of the committee's research thus far will be presented as a series of articles in Neurosurgery. The intention is now, as it was originally, to contribute scientific articles on the NFL's research on the biomechanics of concussion, the epidemiology of the injury, its symptoms and treatment, neuropsychological evaluations, and other aspects of MTBI. Thanks to the support of the NFL, NFL Charities, owners, executives, team medical staffs, players, and committee members, the NFL's approach to funding scientific research on the problem is a model for the approach needed by other sport leagues when medical issues of player health and safety emerge."

2) It is important to consider the psychological response to NLTs as well as the physiological and physical response. Three articles are reprinted to provide a background for psychological response to trauma. The first is titled "Common Reactions to Trauma," by Edna B. Foa, Elizabeth A. Hembree, David Riggs, Sheila Rauch, and Martin Franklin, of the Center for the Treatment and Study of Anxiety, Department of Psychiatry, University of Pennsylvania. They write:

"A traumatic experience produces emotional shock and may cause many emotional problems. This handout describes some of the common reactions people have after a trauma. Because everyone responds differently to traumatic events, you may have some of these reactions more than others, and some you may not have at all. Remember, many changes after a trauma are normal. In fact, most people who directly experience a major trauma have severe problems in the immediate aftermath. Many people then feel much better within three months after the event, but others recover more slowly, and some do not recover enough without help. Becoming more aware of the changes you've undergone since your trauma is the first step toward recovery. Some of the most common problems after a trauma are described below:

Fear and anxiety. *Anxiety is a common and natural response to a dangerous situation. For many it lasts long after the trauma ended. This happens when views of the world and a sense of safety have changed. You may become anxious when you remember the trauma. But sometimes anxiety may come from out of the blue. Triggers or cues that can cause anxiety may include places, times of day, certain smells or noises, or any situation that reminds you of the trauma. As you begin to pay more attention to the times you feel afraid you can discover the triggers for your anxiety. In this way, you may learn that some of the out-of-the-blue anxiety is really triggered by things that remind you of your trauma.*

Re-experiencing of the trauma. People who have been traumatized often re-experience the traumatic event. For example, you may have unwanted thoughts of the trauma, and find yourself unable to get rid of them. Some people have flashbacks, or very vivid images, as if the trauma is occurring again. Nightmares are also common. These symptoms occur because a traumatic experience is so shocking and so different from everyday experiences that you can't fit it into

what you know about the world. So in order to understand what happened, your mind keeps bringing the memory back, as if to better digest it and fit it in.

Increased arousal is also a common response to trauma. *This includes feeling jumpy, jittery, shaky, being easily startled, and having trouble concentrating or sleeping. Continuous arousal can lead to impatience and irritability, especially if you're not getting enough sleep. The arousal reactions are due to the fight or flight response in your body. The fight or flight response is the way we protect ourselves against danger, and it occurs also in animals. When we protect ourselves from danger by fighting or running away, we need a lot more energy than usual, so our bodies pump out extra adrenaline to help us get the extra energy we need to survive. People who have been traumatized often see the world as filled with danger, so their bodies are on constant alert, always ready to respond immediately to any attack. The problem is that increased arousal is useful in truly dangerous situations, such as if we find ourselves facing a tiger. But alertness becomes very uncomfortable when it continues for a long time even in safe situations. Another reaction to danger is to freeze, like the deer in the headlights, and this reaction can also occur during a trauma.*

Avoidance is a common way of managing trauma-related pain. *The most common is avoiding situations that remind you of the trauma, such as the place where it happened. Often situations that are less directly related to the trauma are also avoided, such as going out in the evening if the trauma occurred at night. Another way to reduce discomfort is trying to push away painful thoughts and feelings. This can lead to feelings of numbness, where you find it difficult to have both fearful and pleasant or loving feelings. Sometimes the painful thoughts or feelings may be so intense that your mind just blocks them out altogether, and you may not remember parts of the trauma.*

Many people who have been traumatized feel angry and irritable. If you are not used to feeling angry this may seem scary as well. It may be especially confusing to feel angry at those who are closest to you. Sometimes people feel angry because of feeling irritable so often. Anger can also arise from a feeling that the world is not fair.

Trauma often leads to feelings of guilt and shame. Many people blame themselves for things they did or didn't do to survive. For example, some assault survivors believe that they should have fought off an assailant, and blame themselves for the attack. Others feel that if they had not fought back they wouldn't have gotten hurt. You may feel ashamed because during the trauma you acted in ways that you would not otherwise have done. Sometimes, other people may blame you for the trauma. Feeling guilty about the trauma means that you are taking responsibility for what occurred. While this may make you feel somewhat more in control, it can also lead to feelings of helplessness and depression.

Grief and depression are also common reactions to trauma. This can include feeling down, sad, hopeless or despairing. You may cry more often. You may lose interest in people and activities you used to enjoy. You may also feel that plans you had for the future don't seem to matter anymore, or that life isn't worth living. These feelings can lead to thoughts of wishing you were dead, or doing something to hurt or kill yourself. Because the trauma has changed so much of how you see the world and yourself, it makes sense to feel sad and to grieve for what you lost because of the trauma.

Self-image and views of the world often become more negative after a trauma. You may tell yourself, "If I hadn't been so weak or stupid this wouldn't have happened to me." Many people see themselves as more negative overall after the trauma ("I am a bad person and deserved this."). It is also very common to see others more negatively, and to feel that you can't trust anyone. If you used to think about the world as a safe place, the trauma may suddenly make you think that the world is very dangerous. If you had previous bad experiences, the trauma convinces you that the world is dangerous and others aren't to be trusted. These negative thoughts often make people feel they have been changed completely by the trauma. Relationships with others can become tense and it is difficult to become intimate with people as your trust decreases.

Sexual relationships may also suffer after a traumatic experience. Many people find it difficult to feel sexual or have sexual relationships. This is especially true for those who have been sexually assaulted, since in addition to the lack of trust, sex itself is a reminder of the assault.

Some people increase their use of alcohol or other substances after a trauma. There is nothing wrong with responsible drinking, but if your use of alcohol or drugs changed as a result of your traumatic experience, it can slow down your recovery and cause problems of its own.

Many of the reactions to trauma are connected to one another. For example, a flashback may make you feel out of control, and will therefore produce fear and arousal. Many people think that their common reactions to the trauma mean that they are "going crazy" or "losing it." These thoughts can make them even more fearful. Again, as you become aware of the changes you have gone through since the trauma, and as you process these experiences during treatment, the symptoms should become less distressing.

3) The second example of the psychological response to trauma is by Jessica Hamblen, Ph.D. and is titled "The Oklahoma City Bombing." See (Hamblen 2003) and references therein. She writes:

"Almost half of the survivors directly exposed to the blast reported developing problems with anxiety, depression, and alcohol, and over one third of these survivors reported Posttraumatic Stress Disorder (PTSD). People who reported trying to avoid reminders of the bombing and who felt numb afterwards were more likely to develop PTSD and other disorders than people who did not avoid and were able to experience a range of emotions. Predictors of PTSD, anxiety, and depression included more severe exposure, female gender, and having a psychiatric disorder before the bombing (North et al. 1999)).

Over a year after the bombing, Oklahomans reported increased rates of alcohol use, smoking, stress, and PTSD symptoms as compared to citizens of another metropolitan city (Smith, Christiansen, Vincent, & Hann, 1999).

In a group of adults who sought mental-health services, being nervous and being upset by how other people acted when the bombing occurred were predictive of PTSD (Tucker et al. 1997)).

Children who lost an immediate family member, friend, or relative were more likely to report immediate symptoms of PTSD than children who had not lost a loved one (Pfefferbaum et al. 1999)).

Two years after the bombing, 16% of children and adolescents who lived approximately 100 miles from Oklahoma City reported significant PTSD symptoms related to the event (Pfefferbaum et al, 2000). This is an important finding because these youths were not directly exposed to the trauma and were not related to victims who had been killed or injured. PTSD symptomatology was greater in those with more media exposure and in those with indirect interpersonal exposure, such as having a friend who knew someone who was killed or injured (Pfefferbaum et al. 2000)).

4) The third example of how NLTs may affect is a fact sheet by (Monson 2003) can be found at as A National Center for PTSD Fact Sheet at. Dr. Morgan writes:

"Veterans, like other individuals, respond to traumatic situations in a variety of ways. Veterans are responding to the recent terroristic disaster in a manner similar to all Americans. They feel concern, anger, fear, and helplessness, which are all normal responses to an abnormal event. However, research indicates that people who have previously survived traumatic events may be particularly sensitive to the effects of later traumatic events such as terroristic acts and war. In general these events can cause a range of symptoms from general distress to an increase in PTSD symptoms, irritability, anger, alcohol and substance use, sensitivity to military stimuli, sleep disturbance, and avoidant/phobic reactions. Some individuals might anticipate and prepare for the worst possible future circumstances so they are not retraumatized by a subsequent shock. Studies of a recent American terroristic situation and of a recent military situation have provided information about some of the effects such events have on veterans.

Following the Oklahoma City bombing, some veterans of World War II, the Korean War, and some of those in the war during the Vietnam era reacted by experiencing the following more than they had before the bombing: (1) More frequent military and homecoming memories; (2) Depressed mood; (3) General distress; and (4) Posttraumatic Stress Disorder (PTSD) symptoms.

Veterans with PTSD may be particularly susceptible to reactivation or a worsening of their PTSD symptoms if re-exposed to military situations.

During the Gulf War: Vietnam veterans followed media coverage of the Gulf War closely and reported that the coverage brought back thoughts and feelings of Vietnam.

The reactivation or worsening of PTSD symptoms experienced by some veterans may have been related to similarities in the traumatic experiences (e.g., planes were a major part of both events). Situations that have high emotional or symbolic value, such as veteran gatherings or American symbols, also can reactivate or worsen PTSD symptoms."

L.1 REFERENCES

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