AFTER THE INJURY: ACUTE CARE AND TBI

Moderator: Doris McMillon **Panelists:** Dr. Jeffrey Bazarian, Dr. James M. Ecklund, and Dr. Maria Mouratidis

Doris McMillon

When a traumatic brain injury occurs, what happens next? From the ER to intensive care, acute care and TBI is our focus, next on BrainLine.

Voiceover

BrainLine is funded by the Defense and Veterans Brain Injury Center, the primary operational TBI component of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury, through the Henry M. Jackson Foundation for the Advancement of Military Medicine.

Doris McMillon

Welcome to BrainLine. I'm Doris McMillon. This webcast is one in a series of programs we're offering about preventing, treating, and living with traumatic brain injury — or TBI. Today, we look at the medical care provided following the injury. Joining me on our panel is Dr. Jeffrey Bazarian.

Dr. Bazarian is an emergency medicine physician with a strong research interest in traumatic brain injury. He's at the University of Rochester Medical Center. Also with us is Dr. Maria Mouratidis. Dr. Mouratidis is a clinical neuropsychologist and the command consultant and subject matter expert for traumatic brain injury and psychological health at the National Naval Medical Center.

Also joining us is Dr. James Ecklund. Dr. Ecklund is a neurosurgeon and the chairman of the Department of Neurosciences at INOVA Fairfax Hospital, Virginia's largest trauma center. And I want to say thanks to everyone for joining us today. We'd also like to welcome our studio audience and we're going to reserve time at the end of the hour for a question-and-answer session with our panel.

Dr. Bazarian, let's begin with you. How often do you see TBI cases come into the ER and generally what are the causes?

Dr. Jeffery Bazarian

Well, traumatic brain injury's a very common cause of people coming to our emergency department and we probably see on a good day six, seven, eight, maybe 10 patients coming in with traumatic brain injury. Most of these are the milder end, but still it's quite a few coming into our emergency department.

Most of these are from car accidents, motorcycle accidents, and from falls.

Doris McMillon

All right. What's the severity of the TBI cases that you see, and can you describe them?

Dr. Jeffery Bazarian

Sure. Most of the patients who come into our emergency department in Rochester, New York, fall on the more mild end of traumatic brain injury. And the other term for that is concussion. So these are people that have had a brief loss of consciousness or a period of amnesia.

So most of them are at that end. But we do see quite a few at the moderate and severe ends of traumatic brain injury and those people would look like they're in a coma when they came into our emergency department.

Doris McMillon

Okay. Well, we're gonna speak more with Dr. Bazarian in a moment but first let's take a look at a short clip from "Understanding Traumatic Brain Injury." It's a video produced by the Defense and Veterans Brain Injury Center. It presents some really good information about what happens to the brain at the point of impact and injury.

[VIDEO]

Deborah Warden, MD

To think about how the brain works is to realize that the brain controls all of our emotions, our movements, our actions. It allows us to engage in conversation, in our relationships with others, to think not only about what we're going to do but about the future, to reflect on the past.

Voiceover

Everyday, experts are learning more about the brain and its ability to heal.

Deborah Warden, MD

The brain can be affected by traumatic brain injury in several ways.

Voiceover

The most obvious is a penetrating brain injury.

Deborah Warden, MD

With a penetrating brain injury, the dura, or the tough membrane that encases the brain inside the skull, if that's been penetrated, we call it a penetrating brain injury, whether that penetration is by bone or by a fragment of a munition, gun, something like that.

Voiceover

A penetrating wound creates a focal injury causing bruising and swelling to specific areas of the brain.

Deborah Warden, MD

Then you could consider closed brain injury which is separated as mild, moderate, and severe.

Voiceover

Closed brain injuries can be focal or generalized and are characterized by the length of time the patient loses consciousness and the severity of symptoms.

Deborah Warden, MD

There's also what's considered diffuse axonal injury.

Voiceover

Like what happens in whiplash, diffuse axonal is a form of closed brain injury that can twist or tear axons, long nerve fibers that connect cells within the brain, leading to generalized swelling.

Deborah Warden, MD

The potential for the brain to recover is being understood now in ways that it certainly wasn't being understood 10 years ago.

[STUDIO]

Doris McMillon

Well, we know that every brain injury is unique but in all cases the acute care phase can be very important to a successful recovery. Dr. Bazarian, does it matter what hospital or emergency center a person is taken to after an accident, and what should they look for in order to get the best outcome?

Dr. Jeffery Bazarian

I think it's important for people who've had a traumatic brain injury, and this is especially true at the more severe ends of brain injury, that they go to an emergency department that has the ability to perform a CAT scan rapidly and that has a neurosurgeon that can be standing by, ready to remove a blood clot that could be potentially life threatening.

Doris McMillon

Now, when someone is brought to the ER with a brain injury, what are the first concerns?

Dr. Jeffery Bazarian

We have several concerns when someone's first brought to Emergency, and obviously these concerns would be a little bit different for someone at the milder end of things than at the severe end of brain injury. At the severe ends of traumatic brain injury — so someone who comes in and appears that they're in a coma — we're very concerned with securing their airway and making sure that they're breathing properly.

Those two things are very important for limiting any subsequent brain injury that they might have. And then, thirdly, we also need to maintain their blood pressure. And we do all these things as quickly as we can so that we can move on to getting the CAT scan, which is a kind of picture of their brain, which really helps us know what we need to do next.

Now at the milder ends of brain injury, the concussion, we're focused more on getting the CAT scan and figuring out what to do after that.

Doris McMillon

Okay. Is it easy to tell if a person has a brain injury? I mean, what are you looking for?

Dr. Jeffery Bazarian

Well, that's a very good question. When someone comes in in a coma, it's more obvious that they have a brain injury. Their brain's not working 'cause they're not awake. So our physical exam — it just helps us confirm how severe that is. But at the milder end of things, at the concussion end of things, it is difficult to know whether someone's had an underlying brain injury.

And, honestly, the tools that we have in the emergency department to understand that, to figure that out, are pretty limited.

Doris McMillon

Well, what are some of the tools that you use to detect a brain injury and then how effective are they?

Dr. Jeffery Bazarian

Good questions. We have really two main tools to detect a brain injury and I'm talking more now at the milder end of things. One is our physical exam, so kind of our diagnostic acumen. That's pretty limited, though, because concussion patients look like we all do sitting here, look pretty awake and alert.

So, normally, the physical exam is not revealing. A CAT scan, which is that picture of the brain, is also a fairly crude tool for seeing the nerve cells that we suspect are injured. And most of the time people with a concussion have a normal looking CAT scan so it doesn't really help us in that regard.

Doris McMillon

Well, is there anything on the horizon that could improve your ability to detect a brain injury in the ER?

Dr. Jeffery Bazarian

Yes, there is. It appears that when people have had a concussion, there are some proteins that may be released when the nerve cells get damaged that find their way into the blood. So we could take a sample of blood from a patient's arm and tell them whether some of those proteins are in the blood, and that will help us know whether they have had a brain injury.

There's at least one test being used in Europe in this regard and it's called S100B. And there are many groups in the United States that are studying it now. And I think in the future, you're going to be seeing blood tests being used to help diagnose brain injury, just like blood tests are used now to figure out if you've had a heart attack.

Doris McMillon

Right. We sometimes hear the term "the golden hour." What does that really mean?

Dr. Jeffery Bazarian

The "golden hour" is a term that's used for the severely traumatized patient. And I think the thought was that you've got about an hour to get that traumatized patient from the field into the emergency department or into the hands of surgeons and emergency docs to figure out where there's life-threatening bleeding, to get that bleeding stopped and get that patient's life saved.

As it turns out, that it's probably a little bit longer than an hour that you have, but it still is a worthy concept in that we need to get people from the field to the emergency

department as quickly as possible. So people talk about getting them in that "golden hour" to our ED.

Doris McMillon

Okay, you know, if you're not certain whether a person coming into the ER has had a brain injury, how do you most accurately and then rapidly diagnose and treat it?

Dr. Jeffery Bazarian

Well, from an emergency medicine perspective we're most concerned with saving someone's life and diagnosing that brain injury that's gonna take someone's life in the next hour—during that "golden hour". So getting the CAT scan is what we're focused on, because that tells us whether we've got a blood collection that someone like Dr. Ecklund could remove.

In terms of figuring out the more subtle things, whether there's injury to those brain cells, that's—we still haven't conquered that.

Doris McMillon

Okay. How closely can you tie the severity of the injury with the severity of the outcome?

Dr. Jeffery Bazarian

I think you can tie them pretty closely. People who come in in a coma have worse outcomes than people who just have a loss of consciousness. But I do want to emphasize, though, that we call the milder end of things "mild traumatic brain injury" but it isn't really so mild.

So these people still have problems that affect them for three, six, sometimes even 12 months.

Doris McMillon

Okay, let's say you have somebody arrive in the ER who's intoxicated and they may have a head injury. Does it make it more difficult to diagnose TBI, and then what do you do?

Dr. Jeffery Bazarian

Yes, it makes it much more difficult for us to diagnose TBI. As I told you before that — one of the two tools that we have to diagnosis is our physical exam. And when someone's intoxicated, I can't really tell whether they're not acting right from the alcohol or not acting right from the brain injury.

So, we lose that tool. So we have the CAT scan but, as I told you before, most of the time that's negative. So, what we need to do in that case is usually keep people in our ER until they're sober, which can be six, 12, sometimes 24 hours.

Doris McMillon

Wow! How well are we doing standardizing treatment for TBI in ERs across the country?

Dr. Jeffery Bazarian

That's a great question. At the severe end of things, the Brain Trauma Foundation has published and tried to disseminate a group of guidelines on how to care for folks who are more severely injured. And I think that they've done an excellent job in that regard.

Many hospitals, including our own, use those guidelines. The milder end of things … we have some work to do. We still don't know exactly what to do for folks at various stages. DVBIC, as Deb Warden mentioned in your clip, is working on that.

The American College of Emergency Physicians is also working on some guidelines … who should get CT scanning and when and then who should get follow up and where should they get follow up and what kind of discharge planning should we do.

Doris McMillon

Okay. What role can ER docs play in educating the public about brain injury?

Dr. Jeffery Bazarian

I think we have a pretty good role to play in that regard. I think, one, when someone comes in with a traumatic brain injury, we can educate them that some of the symptoms they may have are directly related to their brain injury. They're not crazy; it's related to their brain injury.

So we can help make that link, and we think that that helps them heal quicker. We also can help the person in the room next door to them who maybe sprained their ankle and tell them, "Hey, by the way, the next time you go out driving your car, make sure you use a seatbelt so you don't get a brain injury".

"Or next time you play in a contact sport, make sure you wear a helmet, so you don't get a traumatic brain injury."

Doris McMillon

Now do medical students get a lot of instruction about brain injury?

Dr. Jeffery Bazarian

Boy, I don't think they do. I think we could do a much better job at the level of the medical school curriculum, teaching them about traumatic brain injury, just like they learn about stroke and Alzheimer's from day one. Because it's clear that many primary care physicians out there just don't have the education and the training to be able to take care of our patients once we send them out from Emergency.

Doris McMillon

Okay, Dr. Bazarian. Thanks so much. Dr. Mouratidis, let me turn to you. What is the process that families go through when their loved ones are in the ICU?

Dr. Maria Mouratidis

Well, certainly it's very traumatic also for the entire family and friends when someone has been severely injured and is in the emergency department or in the ICU. And so our first really important effort is, one, to join the family in recognizing and validating that this is very upsetting and that they're not alone, and immediately starting to provide education about brain injury, education about the recovery process, the treatment process.

Trying to involve them as much as possible in the treatment plan and connecting with the, really, team of physicians, nurses, pastoral counselors, chaplains, that really are involved in a very multidisciplinary approach so that it can help them manage their expectations about the recovery process and feel like they certainly know what's going on.

Doris McMillon

Okay. Dr. Ecklund, let me turn to you. You retired from the military last year and you're now working with the civilian population. What's been the biggest change for you as a neurosurgeon working with people with TBI?

Dr. James Ecklund

You know, if someone has a brain injury, it really doesn't matter if they're military or whether they're a civilian. The military population will have more of a blast injury and penetrating injury in the deployed status. And there's also, when you're deployed, more of a resource-constrained environment that you have to deal with. But the injury's the same and people are the same.

Doris McMillon

Right. In a civilian hospital like INOVA Fairfax, after a patient's been transferred from the ER to you in ICU, what are the first steps that you take? What are the tests you might use?

Dr. James Ecklund

I'll actually see them in the ER, so they don't have to come up to the ICU. And we're involved right at the beginning to do an neurologic exam and check their level of consciousness, their pupil reaction, whether they have weakness on one side or another, and then evaluate the CT scan as well to put the whole package together and try to determine what the next best course of management is.

Doris McMillon

Now what are some of your major concerns when you have a new patient with TBI?

Dr. James Ecklund

Well, you want to always ensure that the oxygenation is optimized and good. You want to make sure that the blood pressure is maintained and the basic, you know, airway breathing, circulation type things. Then you start thinking about protecting the brain.

And we want them — you know, the skull is a closed container so we want to make sure the pressure inside the skull stays normal. Make the environment for healing, because we can't affect — we can't change the fact they've had a brain injury, but make the environment for healing optimized.

So, we want to control the ICP and make sure all the other physiologic variables are normal.

Doris McMillon

Okay. Are open and closed injuries treated differently and — or does it just depend on the individual case?

Dr. James Ecklund

No, the general management of brain injury is going to be the same from the standpoint of ICP management and prevention of some secondary injuries. The penetrating injury is different in that you have a debridement to do. You have to make sure the wound itself is clean and closed and possibly debride foreign bodies and tissue on the brain.

You want to be very careful to make sure that the dura, the membrane over the brain, is closed in a water-tight fashion so you don't leak cerebral spinal fluid out, because that's a very high incidence of infection when you have that situation.

And then in a penetrating injury as well, triage of the patient is — while it's important in all cases — it becomes more acute in a penetrating injury because if you put together the clinical exam of the patient and the trajectory of injury on the CT scan, you can

sometimes determine that the outcome really is not one that anyone would want to live. And you would not necessarily intervene in that case.

Doris McMillon

Okay. When is surgery indicated?

Dr. James Ecklund

Surgery's indicated whenever you have a mass effect on the brain, putting pressure on the brain. To remove that, whether it's a blood clot, whether it's a fact that there may not be a blood clot that needs to be removed but if you have an exam that is very compromised.

And the Glasgow Coma Scale is something we use, which is a scale from three to 15, 15 being normal, three being the lowest you can be. At eight or so the exam is so unreliable that we can't tell if someone deteriorates neurologically. So we'll put a monitor in the brain and the surgeon will do that.

And the monitor will tell us what the pressure is. And if we put the monitor into the ventricle, which is the fluid sac of the brain, we can actually drain some fluid and thus treat the pressure at the same time.

Doris McMillon

Okay. What are some of the common secondary medical complications that can happen to a person after the initial brain injury?

Dr. James Ecklund

Well, we want to prevent seizures, so we'll generally give people anticonvulsants to do that. Again, we talked about oxygenation and then preventing ischemic effects or lack of oxygen to certain parts of the brain. And we can monitor that with various brain tissue monitors.

For the seizures, we also can occasionally do an EEG and in some centers we're doing continuous EEG to try to really pick up on those early on. And then there are hosts of systemic complications that you just want good, general intensive care to prevent those other type of complications.

Doris McMillon

Now if a person has multiple physical injuries as well as a brain injury, in which order are these handled? And tell us the how and the why.

Dr. James Ecklund

Well, people talk about life, limb, and eyesight. And, really, when you're talking about life, you're talking about the brain. You've got to, again, assure circulation. You have to assure airway, breathing. But then, very quickly, you have to protect the brain. And, again, we're going to do that through the mechanisms we talked about.

And when the ICP does go up, the intracranial pressure, what can we do? Well, we can drain fluid from the ventriculostomy, if we have that in. We can give them some type of medication such as Mannitol or Hypertonic Saline, which can kind of shrink the swelling or reduce the swelling in the brain.

We can do simple things like prevent fever, which we do at the outset. Keep their head straight so the venous drainage is normal. Put their head up about 30 degrees. And if they continue to have difficulty, we can paralyze them. That's another thing we'll do early, and we can also give barbiturates at times.

And then there are more radical things, which we're actually doing quite a bit in the theater because of the blast injuries we're seeing, where we'll actually take off part of the skull in order to allow the brain to swell into that portion to, again, save their life and provide the ability to recover.

Doris McMillon

All right, if surgery isn't the answer to a person's outcome, what do you do?

Dr. James Ecklund

Well, you know, our job is to cure when we can certainly, but to comfort always. And so every family … we ought to spend an incredible amount of time with the family because these are devastating injuries, especially a severe injury. And every family wants to know 'what is my son, daughter, wife, spouse, whatever, going to ultimately be like.'

And that's a tough question because none of us has a crystal ball to know exactly what things are going to look like one month, two months, three months down the road. And sometimes, recovery from a severe brain injury can take up to one or two years. So we have some general rules.

Other than looking at the CT scan and what that shows us, some general rules are age, the younger age your patient, the better they do in general; the more severely injured, the lower on the coma scale we talked about they are, the less likely they are to have a better outcome despite, you know, excellent care; and then how rapidly they really improve and respond to therapy and start to improve in their status, that gives us a hint too.

Doris McMillon

Okay. Are blast injuries different from, say, an injury from a serious car accident?

Dr. James Ecklund

Some of the blast injuries, some of the components of blast injury are the same. In a car accident you'll have an impact injury frequently if the head strikes an object. Well, in a blast — for instance, a soldier with an IED, he will potentially be thrown and his head will strike something.

In an automobile accident, you'll have a deceleration/acceleration-type injury or rotational-type injury. Same thing with the blast injury with the acceleration of a person. Now, in a blast injury, you'll have more common penetrating injuries associated with this. You'll also have penetrating injury.

But the other unique things in the blasts are the over pressure, what we call "primary blast injury," which is the over-pressure wave that comes through. Traditionally, we thought that it affected air-filled cavities, the tympanic membranes, the lungs, the bowel, but there hasn't been a lot of knowledge or appreciation that it might have an effect on solid organs like the brain.

And then there's other things in a blast like toxic affects and EMP, electromagnetic pulse, the heat that's generated. These are all other things that I think we need to … when we're trying to figure out what really is a blast injury compared to a standard motor vehicle-type injury, what the difference is.

We need to be open to all those possibilities as possibly injurious as we look and make observations, what the difference between the different injuries are.

Doris McMillon

What kind of research is being done on this front and what have you learned so far?

Dr. James Ecklund

Well, you know, it's interesting. The observation from the Conflict is that almost every neurosurgeon that's been deployed over to Iraq specifically, and in some cases Afghanistan, have seen that these patients that are exposed to a significant blast injury will often have more edema than we normally see, more hyperemia or increased blood flow on the surface of the brain, when they actually do an operation.

That's made us do more decompressive hemicraniectomies in this conflict in the theater for that reason. So the question is, what causes that? Another observation we have is

what has caused the vasospasm that we've seen in a delayed fashion in a significant number of blast-exposed patients?

So I'm pleased to say there's a number of efforts ongoing trying to understand the mechanisms of blasts and what causes these observations we've seen, really trying to drill down the mechanisms of the blasts and what is different about them and then how can we treat them better.

As far as treatment throughout the country, there are a number of things being looked at, predominantly in intensive care units and things like … We talked a little bit about the partial — or the brain-tissue oxygenation. How does that help us? How does that not help us?

Micro-dialysis of some of the chemicals in the brain, where we can real time try to determine the levels, and how does that help us, how does that not help us manage patients? Continuous EEG, how does that help us? How does that not help us? So there's a lot of these type of efforts to help us provide even better care than we currently are to the severely head injured patient.

Doris McMillon

What are some of the other promising areas of research?

Dr. James Ecklund

Well, I think that we've hit a number of those. The things that also are on the horizon are things like diffusion tensor imaging for an MRI, and functional imaging with MRI to let us better determine prognosis. We've gone in the theater where triage can be somewhat challenging.

We've also utilized Transcranial Doppler, which is a measure of blood flow, to try to help us determine what the salvagability of a patient is. But there could be some work there as far as prognosis as well and in helping us improve care.

Doris McMillon

All right, thank you so much. Dr. Bazarian, let me come back to you. Are you aware of any research that looks at non-surgical techniques for treating brain injury?

Dr. Jeffery Bazarian

Well, I think there's several things out there that could be used to improve outcome after the types of brain injury that don't require an operation, but most of these hinge on some type of accurate diagnosis. So we need some way to know, other than guessing, whether someone's got some brain injury.

And I mentioned that there are things like blood markers, and Dr. Ecklund mentioned diffusion tensor imaging as ways to kind of diagnose. Now if you could diagnose that brain injury, there are some medications waiting in the wings to be tested on patients, medications that seem to prevent those nerve cells from dying once they get overly stretched by the injury itself.

But we really can't begin to test those in humans until we have an accurate way to diagnose the injury.

Doris McMillon

Okay. Dr. Mouratidis, what are the challenges that families face when it comes to understanding complex medical information?

Dr. Maria Mouratidis

Certainly having a loved one injured is very overwhelming and sometimes all of the medical information can be also very overwhelming. So, working together with the treatment team to help the family answer the questions that they're most concerned about and titrate, basically guide, the amount of information that each family feels comfortable with at that time.

Certainly, most of the things that they're worried about are certainly, what are the implications for their loved one, but also the impact on their family. So, certainly, working in an individualized patient and family centered approach by helping each family decide what they need to know when, how much information to give when, what helps them at that point in a very individualized way can really help them deal with the overwhelming event.

Doris McMillon

Okay. Thank you so much. Now I have more questions for Dr. Mouratidis, but first let's take a look at a video produced by the National Road Safety Foundation. Dave and Kelley are two members of the other Breakfast Club, a group of teenagers who met in rehabilitation.

All of them sustained a TBI as a result of car crashes. Let's take a look.

[VIDEO]

Kelley Syverson

Ahhh, what do I want to say about traumatic brain injury? Traumatic brain injury is the most misunderstood injury, I think, that's out there. It can be small or big and then the

aftermath that one encounters after the injury is just amazing, because it's watching each system shut down and then restart again, if you're so lucky.

Cindy Thee (David's Mom)
When David was a little boy, he was the most cautious child I have ever seen, I mean, very cautious. Even when he was starting to walk, he would crawl and just hang on to things and very — he didn't really want to do anything that was risky.

Cynthia Hall, Physical Therapist

Kelley is an exception. In a lot of ways her attitude from the very beginning was one of good humor and courage. There was nothing that I ever suggested that Kelley pooh-poohed or said "I won't try."

Cindy Thee

I remember just before his accident he took me to the Marin Raceway and we went around the S curve in Grand Rapids and we were clipping right along and I'm sort of hanging on and I'm… We made it to the raceway and I said to him, "David," I said, "make sure your heart's right with the Lord," I says, "because you're going to die in this car if you keep up like this." And three weeks later I got the call.

Dave Tubergen

I think I was just in a car just screwing around going too fast and the passenger side wheels went into a ditch, sucked me … sucked me in. I went into a fresh alfalfa field and then it shot me out and I flipped front end over back end five times. And I was airborne.

I hit the ground five times within an eighth of a mile. So you do the math. It was the start of a three-month coma.

JoAnne Pace (Kelley's Mom)

The whole thing in the beginning is that they need to survive. They need to get past that critical stage.

Debra Ryan, RN

With working with the traumatic brain injury population, not everyone will survive. A lot of the injuries we see are because of risk-taking behavior, drinking and driving being one of the biggest ones which leads you down to things like racing cars at high rates of speed and not having good judgment.

Some are the result of things that are purely accidental — bad road conditions; people driving too fast; slick, icy roads; not being able to stop in time; being sidetracked; talking

on cell phone; and eating and drinking and doing other things other than just driving the car like they should be doing.

Cynthia Hall, Physical Therapist

I wish that like Driver's Ed courses, that part of that was going into a Mary Free Bed or a Hope Network and seeing that it isn't just an accident that you're sick for a while and you get up and you're done. It's not like breaking a leg or breaking an arm. You … when you get done with this, you are not the same person you were before it happened.

And I don't know if you can understand that at 16 or 17 years old, how it changes absolutely everything.

Kelley Syverson

One of the most frustrating things for me has been myself because I probably sabotaged myself, not being aware of it but fighting against the idea that there is anything wrong with me. Well, obviously, there is or I wouldn't be here.

Cynthia Hall, Physical Therapist

When we first met, Kelley was barely able to sit on a mat table. In fact, when she did sit on it, she'd have to hold on for balance. She didn't have any kind of protective reaction, so if she started to fall, she couldn't even begin to catch herself. She could walk, but it took her – let me remember – about 35 minutes to walk 170 feet.

Kelley used to get lost. She had what we call "problems with topographical orientation." So she'd go down the hallway and all of a sudden we'd hear this big laugh and "I'm lost again. Somebody get me!" Simple things. She couldn't find her way around. She couldn't roll over. She couldn't scoot up and down in a bed.

Even simple movements that we take for granted, like turning or twisting, were enough to knock her over.

Scott Truskowski, Occupational Therapist

There's a recognition that the things that we work on with people are things that, you know, 4 and 5 year olds are learning to do developmentally that 18 to 35, sometimes older than that, those people are having to relearn to do it.

Dave Tubergen

I had to learn how to walk, swallow, tie my shoes. My grandmother showed me how to tie my shoes.

Kelley Svyerson

To me it's like a constant struggle because you take two steps forward, three steps back, then three steps forward, two steps back and it's a constant juggling act to get my life back.

Laurie Gastineau, Speech-Language Pathologist

And it's a struggle. It usually takes longer to recover than people expect. There are usually more issues involved than they expect. For example, having to go retake a driving test, it's hard for people to recognize sometimes that they have more impairments than they think they do.

And they have to go through more hoops to regain independence that they are used to.

[STUDIO]

Doris McMillon

Dr. Mouratidis, what are some of the first things you do to help new patients and their families?

Dr. Maria Mouratidis

The first, education is very, very important about the injury, about having an expectation of recovery. That the degree of recovery initially is often uncertain, however, most patients recover to some degree. And helping patients and families … Most people want to sort of get back to where they were before.

It's helping them to focus forward, focusing on their strengths, focusing on what they can do, what they'd like to do in their life and less so on what they used to be able to do, and helping to mobilize family and patient support. Education and support are the two biggest factors that can influence the outcome of traumatic brain injury after the Dr. Ecklunds and the Dr. Bazarians have done what they can do.

Doris McMillon

What are some … what are families most worried about when a loved one has TBI?

Dr. Maria Mouratidis

They're worried about certainly the impact on the whole family system when there's been an injury like this. It changes all the roles and the dynamics in the family. They're worried about that person being able to function as independently as possible and they're worried about how that person is going to be able to interact with them, their intimate

relationships, their relationships with their children, and being able to have those connections.

Doris McMillon

What's the role of a neuropsychologist or a TBI subject matter expert within the interdisciplinary team?

Dr. Maria Mouratidis

The neuropsychologist helps to assess the patient's cognitive and emotional functioning, how their brain is working — their thinking, their feeling, their memory, their attention — and helps … can help diagnose where the injury occurred based on the particular functions that might be affected, and helps to create a treatment plan based on the areas of strength and the areas of difficulty that can help what we call restore those areas of function or compensate where we help the patient find alternative ways to remember things that perhaps they had difficulty with before.

Doris McMillon

Okay, what should patients … or what precautions should people take once they have had a brain injury?

Dr. Maria Mouratidis

Once they've had a brain injury, it's important that they give their brain time to heal. So, time and rest. Monitoring their stress level is very important and also minimizing behaviors, if you will, that could contribute to another head injury like sports accidents, not wearing their helmets, those kinds of things.

Doris McMillon

How important is sleep?

Dr. Maria Mouratidis

Sleep is very important, although sleep can be dysregulated in someone who has a brain injury and it does become one of the primary symptoms that we work very hard with the treatment team to help the patient get their sleep-wake cycle regulated because it does promote healing.

Doris McMillon

And what about other symptoms you have to pay attention to?

Dr. Maria Mouratidis

You can pay attention to symptoms such as chronic headaches, because that can interfere with someone's daily function. These are symptoms that can happen several weeks and months past the injury. Again, we're talking specifically more of the patients on the mild end.

Symptoms that can be evident in terms of problems with attention. Depression is often a symptom that can happen. One, it's a function of the brain injury itself but also if the person tries to get back to doing things that they normally did and they're noticing they're having trouble, it can be very discouraging.

Doris McMillon

Since every brain injury is different, especially for service people who might have also other conditions like PTSD or depression, how do you know how best to treat someone?

Dr. Maria Mouratidis

There is an overlap in an interaction between a brain injury, because that was a traumatic event for example, and associated emotional symptoms or injuries like post-traumatic stress disorder. We're learning very much, especially in the current Conflict, about how psychological injuries and brain injuries interact.

Ultimately, what's more important is treating the patient and their symptoms, not necessarily treating a diagnosis per se.

Doris McMillon

Okay.

Dr. Maria Mouratidis

And that's why the individual treatment plan in the team is very important.

Doris McMillon

How do you know if a service member's symptoms are a result of TBI or post-traumatic stress syndrome? Is there research being done to kind of sort this out?

Dr. Maria Mouratidis

Certainly a lot of research is underfoot and, as Dr. Ecklund said, I'd like to echo that optimism and the encouragement, that a lot of really important work is currently being done. Ultimately, a thorough evaluation, a comprehensive evaluation by a treatment team, can help sort out some of those symptoms but, once again, what's most important is

treating the symptoms and the difficulty that the patient is having regardless if it's caused by TBI or a psychological injury.

Doris McMillon

All right. Why should injuries sustained in theater be treated differently from, say, someone who's sustained an injury in … or who's been in an injury in a car accident or they were hit while playing football?

Dr. Maria Mouratidis

Certainly we're learning much more about the head injuries sustained in a combat situation. One of the primary differences is that, as Dr. Ecklund mentioned, there's a multiple mechanism factor which we don't necessarily see in the same way in civilian kinds of injuries.

It's important to recognize we don't know the natural course or the history of these kinds of illnesses or disorders at this time, and that's why repeated assessments and treatment that's tailored to the particular patient is very important.

Doris McMillon

During the course of the current wars, what improvements, changes have been made in treating service members?

Dr. Maria Mouratidis

I think military medicine advances healthcare for the world, during a time of war, especially. And traumatic brain injury is not a new illness or injury in this country; however, a lot more attention is currently being turned to it.

And we're learning much more about brain injuries in general, about prevention efforts, intervention, and ultimately improving the quality of life of persons and their families who have suffered a traumatic brain injury.

Doris McMillon

Are there any mandatory tests that they have to take now?

Dr. Maria Mouratidis

We have evolved — and I'm at the National Naval Medical Center — a protocol of tests that patients will go through when they return from theater. And they include audiology testing — knowing that the effects of a blast can affect their eardrums; dental exams — learning that the force of the blast can cause cracked teeth, expose nerves in the teeth.

Certainly, if there's any fragments or any concerns about their eyesight, that is part of the assessment, as well as a full mental health evaluation and a full neuropsychological testing.

Doris McMillon

And what's being done today pertaining to pain perception and pain management?

Dr. Maria Mouratidis

That's a … it's a burgeoning area. Our service members returning have what we call polytrauma, polytraumatic injuries, significant physical injuries in addition to their brain and psychological injuries. Some of the literature that is coming out is showing that pain is processed differently in patients that have a traumatic brain injury.

And pain and isolation are actually two of the biggest predictors of who may have worse post-traumatic stress disorder over time. So, the focus on pain and also helping to use non-pharmacological interventions for pain management is also an area of need.

Doris McMillon

When is family education and family-centered care so important?

Dr. Maria Mouratidis

Traumatic brain injury affects the entire family and the entire functioning of that family. Helping patients and their families to understand what to expect, that it's more like a marathon, not a sprint, needing to pace themselves, needing to recognize that both … all of their injuries require almost simultaneous treatment, that treating the brain injury in isolation, for example, of the emotional injuries is not going to be as effective.

Doris McMillon

Now, is there a role for the neuropsychologist to play in educating the injured about personal issues like divorce, sexual dysfunction?

Dr. Maria Mouratidis

Certainly it's helpful to take a very comprehensive approach that the impact on relationships and also the stress on a family while they're recovering from a traumatic brain injury is significant.

And, certainly, we see about a year after a brain injury, that's a vulnerable time for divorce for family members. Sexual dysfunction can happen, certainly, because of brain dysregulation or also emotional consequences such as PTSD, depression. And that's why educating people about the symptoms and to talk about it with their healthcare providers is so important because there are some things that we can do to help those things.

Doris McMillon

Okay, now Bethesda Naval Hospital is one of the best hospitals worldwide for people with TBI. Can this expertise be implemented at other hospitals — military and civilian?

Dr. Maria Mouratidis

Certainly, the opportunity for sharing is tremendous and we interact with our partners, certainly a Walter Reed, and with Army and Air Force and working with the VA and with private academic partners to bring all of the resources and the knowledge to bear, as well as to create guidelines and, certainly, the science that can impact the quality of care throughout the country and the world.

Doris McMillon

Okay. Tell us what you've learned since you've been working with soldiers, with TBI and their families.

Dr. Maria Mouratidis

Well, certainly, it's been first, a pleasure and a privilege to serve our wounded and their families. And perhaps probably the most noteworthy experience is their tremendous capacity to overcome and their resilience and courage in their recovery. That it is a very … very much a sacred experience to sit with them and their families as they continue to heal.

Doris McMillon

All right. Thanks so much, Dr. Mouratidis. This is the time in our program when we take a few questions from our studio audience, and we have our first questioner. Please go ahead.

Audience Member 1

When is someone with a severe brain injury considered out of the woods?

Doris McMillon

Dr. Ecklund?

Dr. James Ecklund

Well, the recovery from a severe brain injury is really a continuum from the acute care all the way through the rehabilitation process. And it's really a transition, but certainly in the first week to up to, in rare cases, 10 days to two weeks.

The intracranial pressure is something that we need to critically monitor and it takes that much time for the swelling and some of those secondary effects in the brain to really be

treated. Then after that, we continue to give good medical care but it starts transitioning more to a rehabilitative phase.

Doris McMillon

Okay. Let's take our next question.

Audience Member 2

Does talking to somebody while they're in a coma help, and can he or she hear?

Doris McMillon

Dr. Ecklund?

Dr. James Ecklund

You know, we are never a hundred percent sure when someone's in a coma whether they understand and hear what we're saying or whether they don't. My guidance to families to loved ones is to assume that they can hear you, because there are cases where people wake up and say, you know … and can recall conversations that were in the room that you thought they couldn't.

So, assume they can. And bring in things that are familiar to the patient. Bring in things that they would like and that may be comforting to them to help them with the healing process.

Doris McMillon

Dr. Mouratidis?

Dr. Maria Mouratidis

I think that's very important that the connection is still kept with the patient, with the loved one, and being able to communicate and to, as Dr. Ecklund says, to help them to be comfortable and to do the things that you know will help them feel better can help families and patients as well.

Doris McMillon

Thank you. Let's take our next question.

Audience Member 3

How can early diagnosis help improve how someone does over the long term?

Doris McMillon

Dr. Bazarian?

Dr. Jeffery Bazarian

Yeah. I think it's very important for people to get early diagnosis, especially at the milder end of things. One of the things I didn't mention before is that there is a small percentage of people who have a concussion, or mild TBI, that have a collection of blood on their CAT scan that's potentially life threatening.

It's something that Dr. Ecklund would need to remove. Now if we don't get them to a CAT scanner and get that diagnosed, then that's gonna be a problem. So for the five percent or so of concussion patients that have those abnormal CAT scans, getting them to a hospital quickly is important.

Now for everybody else, I think it's still important for them to come to a hospital, even at the milder end of things. I think we need to be able to show them that the CAT scan is normal, if one is done, and then to help them understand that they may have some problems down the line and that it probably is related to their brain injury but that this will get better.

Again, helping them understand those links, I think, improves the healing process. It also kind of closes the loop. We can say, you know, make sure you're in contact with your primary care doc. So without them coming to us in a timely fashion, we can't do those things.

Doris McMillon

Let's take our next question.

Audience Member 4

What plans are in the works to provide long-term community-based support services for military veterans and how will that support be funded?

Doris McMillon

Dr. Mouratidis?

Dr. Maria Mouratidis

Certainly, this community reintegration is a very important part of brain injury recovery and so we're working closely with our VA partners and civilian organizations and institutions in the community to mobilize resources around where that family lives. I had a double amputee tell me once, who was also paralyzed, "I can't give my child, my daughter, a piggyback ride but I have a lap."

Getting the service member back home where that child can be in their lap as soon as possible is very important. So, we work closely with the treatment teams at different institutions to help bring what we've learned in military medicine to the community and also help to educate families about what resources to turn to and to caution them that you can't necessarily believe everything you read on the web.

So helping them, because it can be alarming sometimes if they can get misinformation, information that they don't necessarily understand. So we provide lists of resources that we've checked out that we find credible.

Doris McMillon

We'll take our next question. Please go ahead.

Audience Member 5
What long-term issues do you think veterans from the current wars will be dealing with down the road?

Doris McMillon

Dr. Bazarian?

Dr. Jeffery Bazarian

Well, in terms of trying to figure out what long-term issues might be related to traumatic brain injury for veterans, we kind of have to draw on our knowledge from veterans from prior conflicts. And, as Dr. Ecklund and Dr. Mouratidis have mentioned, many of our veterans now have blast-related brain injury and that may be different than prior conflicts.

But if prior conflicts are any guide, we know that our veterans are going to be struggling with several things. There's a risk of seizures that may affect people for long term. There's problems with substance abuse which we know that traumatic brain injury definitely increases that risk.

There's also a small risk of some neurodegenerative problems like Parkinson's and Alzheimer's. So these are all things that our veterans are gonna be facing down the line. To what extent? After this conflict it's not quite clear.

Doris McMillon

All right. Well, before we close I'd like to get some final comments from each of my panelists here. Dr. Bazarian, let me start with you.

Dr. Jeffery Bazarian

Thanks. I wanted to emphasize that we have a full spectrum of brain injury. At the milder end of things, which is something I see very often in emergency, we want folks to try and come to emergency as quickly as they can to get that CAT scan and to get our educational advice.

But one thing I want to really emphasize is that although the term is mild traumatic brain injury, it's really not mild. Many people have problems after this injury that go on for three, six, and even 12 months. And I think that when people understand that, hopefully we can get them to emergency and get their disability reduced over time.

Doris McMillon

Dr. Ecklund.

Dr. James Ecklund

You know, it's really been the highlight of my life to care for the brave men and women, both in a deployed status and back in the states that are on the front lines defending our shores, and it's given me a passion for this problem of traumatic brain injury. And whether it's in the military or the civilian community, it continues to be a significant problem for our society.

And I'm pleased that we are making incredible jumps. And if you look at the … over the last several decades, the improvement in care and the improvement in outcomes has been dramatic. And I hope through continued innovation and research and hard work on many, many people's parts, we can continue to improve the outcome in the future.

Doris McMillon

All right. Dr Mouratidis.

Dr. Maria Mouratidis

There is hope, and hope is renewed everyday. And to really focus on what you can do, what you want to do and that there may be new discoveries both medically, both personally, the ability of the body, the mind and the spirit to overcome is tremendous.

Doris McMillon

All right. Well, I'd like to thank our panel, Drs. Bazarian, Ecklund, and Mouratidis, and thanks as well to our studio audience. I'm Doris McMillon. Thank you for watching us on BrainLine.org.

Voiceover

BrainLine is funded by the Defense and Veterans Brain Injury Center, the primary operational TBI component of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury, through the Henry M. Jackson Foundation for the Advancement of Military Medicine.