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Session: Combat-related TBI: Patient Subtypes, Empirical Evidence, and Treatment Implications

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Dr. Ralph DePalma: It’s a pleasure today to have Dr. Jason M. Bailie who is a neuropsychologist and Senior Clinical Research Director at the DVBIC United States Marine Corps Pendleton Base. Dr. Bailie and his associates have extensive background in mTBI research, recently publishing a very useful paper as a group on the unique clinical pictures that follow particularly mild TBI. It is a pleasure to have you. Thank you, Jason.

Dr. Jason M. Bailie: Thank you, Dr. DePalma. I really appreciate it and grateful for the opportunity to speak with you guys and discuss some of the work we’ve been doing. I have a really strong level of excitement over this particular project and I think that it holds a lot of value for not only research perspective and understanding what combat related mild traumatic brain injury represents and the various phenotypes that can result from that kind of injury. But also into how we treat and improve treatment throughout our DOD MTFs, our military treatment facilities and of course throughout the VA where the brunt of the labor is done.

I’m going to go ahead and discuss some work we did that tried to examine the various subtypes of combat related mild traumatic brain injury and then use some empiric evidence that supports that and some treatment implications. So of course this is my own opinion, not that of the DOD, the Department of the Navy or the Marine Corps. I work at Camp Pendleton which is a Marine Corps base and most of my work in terms of research and clinical work focuses on those issues. So the active duty service members, what I know most about, have the most experience working with.

As we talk about the relationship between the military and mild traumatic brain injury, we can recognize its importance solely based off of numbers. DVBIC, Defense and Veterans Brain Injury Center, has done a lot of work in terms of tracking and recording the incidents of traumatic brain injury throughout the military system. We can recognize that it is a really common injury. It has a lot of social, media attention and a lot of policy attention both from the government end and from the civilian end. We all are aware of mild traumatic brain injury. Movies have been made about concussions.

In this thing, we can recognize what the importance of it is and what we can do to better treat those individuals and to improve our standard of care. Part of that is just recognizing what the military is doing and how military is addressing the issue of traumatic brain injury. We know that a large number of service members who are engaged in active combat will experience a mild traumatic brain injury. Estimates between 15 and 30% of individuals deployed in Iraq and Afghanistan sustained a mild traumatic brain injury. There’s a blast, training incidents, IEDs through various mechanisms. We have a force that is made up of young men that are doing high risk activities. So they are a high risk of sustaining concussions and mild traumatic brain injuries.

As we work towards understanding kind of what that picture is, there has been more attention being paid on the in garrison injury meaning injuries, traumatic brain injuries that were sustained or diagnosed in theater. We’re beginning to recognize that a lot of injuries are actually diagnosed and treated in the United States through our military treatment facilities and then of course handed off to the VA system. Right now the current estimate is about 85% of those injuries are in garrison. That’s a little bit deceptive in some ways in that number represents not only injuries that are sustained while an individual is doing combat training for example or injured in a motor vehicle accident while on town or unfortunately in a bar fight or what have you. A lot of these injuries that we’re seeing that are “diagnosed and treated in garrison” are actually old injuries that were sustained while the individual was deployed. I know the military treatment facility that I work at, we’re routinely getting people presenting for treatment of their traumatic brain injury and the incident occurred five, six, seven years ago. I know that’s also the case in the VA system. So even though many of those are diagnosed in the United States, they are actually old injuries that are still relevant to the combat operations that we were engaged in and continue to be engaged in.

The military is beginning to recognize that part of the best way to treat and to stay ahead of the high rate of mild traumatic brain injury is through policy change and through education of leadership, of command. Now there is actually policies in place that require service members to have a mandatory evaluation of a mild traumatic brain injury if they’re in specific circumstances. For example, if a SM is a vehicle that is associated with a blast event or a collision or a rollover, they’re automatically triggered to get an evaluation for a possible brain injury. Similar if a person is in a specific distance from a blast either inside or outside of the building, they are being directed for evaluation. If they get a blow to the head or \_\_\_\_\_ [00:07:05] witnessed as being unconscious. Even in the situation where the command just has an inclination or a concern about an individual, especially the case where they have been exposed maybe outside the specified distance but they’ve been exposed to multiple blast events. They will be encouraged and they will mandate that SM to go ahead and get an evaluation.

Through these efforts, we have been able to increase the identification rate of traumatic brain injury in theater and have been able to increase awareness of the SM and leadership that allows them to go ahead and basically stay on top of it and give people access to treatment sooner in a more comprehensive way. Part of that is literally advanced the types of treatment that we can deliver in combat arenas. Throughout the forces, TBI centers were developed where individuals who had a mandatory or have suffered a concussion could go and get treatment and go ahead and get evaluated and go through proper services before they return to duty. For example, in the Navy, they set up the Concussion Restoration Care Center in Afghanistan. I work closely with Retired Captain \_\_\_\_\_ [00:08:37] who is the medical director of that center. They had great success. They had a 98% return to duty rate for their individuals that went though that program. So we were able to as a military basically adapt and flex to the needs of conflict to really address the medical requirements of concussions in this type of conflict through use IEDs and blast exposures, what it created.

As we go through and recognize the importance of that issue, we can then begin to get a better understanding of what our treatment options really are. Now part of that is making sure that we are all on the same page. So I understand the majority of people in this audience are familiar with traumatic brain injury but I feel like I have to, want to make sure that we’re all on the same page so we’re not talking about traumatic brain injury on the broader sense. What we’re really talking about is a traumatic brain injury structurally injury or a physiological disruption of brain injury that is following an external force. That external force can be anything, a blast over pressure wave, or a bucket falling on someone’s head. It can be any outside force that then causes the structural or physiological disruption.

After that external force is applied, there is at least one symptom that is immediately present after that injury. Maybe that means knocked unconscious. Maybe it’s having no memory for the event or an alteration in mental status such as being confused or dazed. In some cases you might even have neurological disorders such as dizziness or even praxis \_\_\_\_\_ [00:10:30] disorders can emerge or sensory loss. In more severe injuries you’ll even have intracranial lesions.

Now what we’re talking about here in mild traumatic brain injury is the least severe of traumatic brain injury but it’s still very heterogenial. There are still a lot of variability within what we all call mild traumatic brain injury. So in terms of the diagnostic criteria what we’re really talking about is a loss of consciousness of less than 30 minutes. So when I say loss of consciousness I mean that the individual is really unresponsive. They’re on the ground. They’re not awake. They are not responding to the outside environment. That can last up to 30 minutes. In many cases there is no loss of consciousness or there’s loss of consciousness only brief. But I can speak from my own personal experience that if I had a loved one that was unconscious for 30 minutes, that’s pretty concerning and I’m definitely worried about their health. So in that spectrum you have to remember that it is not unconscious at all, they’re just having that dazed and confused disorientation. And on the other end of the spectrum you have someone that’s unconscious for half hour. And similarly we can have disorientation, alteration of consciousness that lasts a full day or post-traumatic amnesia for a full day. The thing about the level of neurological trauma that would cause someone to lose memory for an entire day can be pretty staggering. We all call that concussion. We all call that mild traumatic brain injury.

I think as a field we tend to go two ways. You can talk to the people like Aaron Zigler who will through neuroimaging will basically come to the conclusion that really no two TBIs are alike. And in the clinic you’ll talk to a lot of people that see a lot of patients and the kind of come to the feeling in some cases that all the patients are pretty similar. You know you have your prototypical mild traumatic brain injury PTSD individual that has pretty much the same cluster of symptoms. They can’t pay attention, they can’t sleep, complaining about their memory. All of these classic kinds of symptoms that we see on a regular basis.

So really the question is there some truth in between. When we look about the amount of variability in mild traumatic brain injury, we talk about the various symptoms forgetfulness, poor attention, slow processing speed, impaired problem-solving, on and on and on. Is there any evidence that there are subtypes of these individuals? Is there a type of patients? Or is the case that they’re all just completely different from each other?

I think when we look at the research we can begin to parse out a few pieces. Just on the very global sense. There is evidence already of one subtype of individuals. We talk about he miserable minority. Ronald Roof, the term that he used to describe the individuals who suffer a concussion or a mild traumatic brain injury don’t get better. That’s in stark contrast to the vast majority of individuals who suffer a mild traumatic brain injury and they’re symptoms free within days to weeks. So we have this classification just at that level of individuals that don’t get better and individuals that do get better.

I’d definitely make the argument that there is a psychiatric subtype. So for mild traumatic brain injuries we know that there’s a lot of emotional symptoms that follow the injury. A lot of the work that I’ve done is focused on anger. We see a pretty marked increase in irritability and anger and outward expression of anger individuals, particularly SM, following their traumatic brain injury or following their mild traumatic brain injury. Then those individuals tend to experience a lot of other emotions. And those emotions tend to look very similar to post-traumatic stress. So when we look at data and we begin to try to look at the relationship between classic neuro behavioral symptoms such as forgetfulness and headaches and things like that, we can see research that’s been done that shows the emotional component can explain away a lot of the persistent symptoms of these classic post-concussive symptoms.

So for example, Rael Lange showed that by controlling for depression or depression accounted for and explained a lot of those variance in individuals with persistent post-concussive symptoms. That was a driving force in that sample. Depression was a driving force in explaining what other symptoms are being presented. Heather Belanger did a similar thing with post-traumatic stress disorder. She demonstrated that when we control for PTSD that accounts for a lot of the variability that we’re seeing on post-concussive symptoms. At least for some individuals it would make sense … for some individuals that they have a prominent psychiatric component.

What we wanted to do is to look at this empirically. So we took a large sample of SM, 1300 of them, that were recruited from across six military treatment facilities including Camp Pendleton, Navy Medical Center, San Diego, Walter Reed, San Antonio, and \_\_\_\_\_ [00:16:52] San Antonio area. And we looked at individuals who had a combat-related mild traumatic brain injury. About 74% of them experienced an OIF, 26% Operation Enduring Freedom, almost half of them we’re seeing them within three months of injury. All these participants had presented to a military treatment facility for treatment of their traumatic brain injury. 84% of them were blast related injuries. So at intake some of the key things that they do as they do at many of VAs and our MTFs are to fill out two questionnaires. The NSI and the PTSD checklist. I’m sure most people in this audience are familiar with these measures because they’re widely administered throughout the VA and throughout the DOD.

The NSI is a measure of post-concussive symptoms. It includes 22 items that assess emotional symptoms like affect, vestibular symptoms such as balance distortions, cognitive complaints like forgetfulness, physical symptoms, sensory symptoms. In contrast we have the post-traumatic stress disorder checklist which included 17 items that look at things like hyperarousal, re-experiencing of emotions and avoidance behaviors.

Now the reason that we did these two measures is recognizing that in a mild traumatic brain injury population specifically one that’s combat-related, there is a high comorbidity between PTSD and NSI. The correlation between these two measures is often significant. There’s a lot of overlap in the constant of these questionnaires. For example, both questionnaires ask about sleep. Both questionnaires ask questions about irritability. Both questionnaires ask items about concentration issues.

What we wanted to do is we took those 22 items from the NSI and the 17 items from the PCL and we combined them and we looked at them as just the 39 symptoms. We put them into an exploratory factor analysis and we realized that there was basically four primary factors that these items all loaded to. That would include hyperarousal which is prominently driven by PCL items. Dissociation and depression which included 4 NSI items and 6 PCL items. Cognitive and headache complaints which included 8 NSI items and 1 PCL item. And then neurological symptoms which included 9 NSI items and no PCL items.

Based off of those four symptom clusters, we tried to do a profile analysis which is our cluster analysis. Really what we’re looking at is not people that do good or do bad but what we’re looking at people who have similar patterns across these four scales. So we want to see if there are subtypes based off of the data that would suggest that there are individuals that have similar patterns.

We did that in two-step process. First, we looked at internal validations. What we did is we completed a cluster analysis that tried to determine if individuals or clusters of patients existed within the population and then we took those clusters and we tried to externally validate them by comparing them to demographic and injury related variables to see if they in fact differ.

So what we see here in this chart is that we identified four distinct groups. So we identified a good recovery group in purple, a primary cognitive group, a primary psychiatric group and then a mixed presentation group. In the purple, the good recovery group, the term is a little misleading in one respect. It is really not about the recovery. It is about low symptomatology. This is a segment of the population which experienced the lowest symptom profile across the four symptom summary scores. So really the only symptom that they experienced severe symptoms on is poor sleep and about 22 to 28% of the people in this group, which was the largest group I should mention of the four clusters we identified, the only problem they regularly had was poor sleep, which about a quarter of them had. That’s actually pretty typical. If I polled this audience, I’m sure 25% of you has a complaint about poor sleep.

When we look at the rates of post-concussive symptoms in this group, so we compare their symptom profiles and their NSI scores to that of other military populations who were deployed, we see that 65% of them, almost two-thirds of this group, had normal rates of post-concussive symptoms. That’s important because we know that post-concussive symptoms such as irritability and poor sleep and things like that are very normal not only in other medical conditions such as orthopaedic injuries but it is normal in healthy people. All of us experience headache. All of us experience irritability. All of us experience insomnia. So really what we’re seeing in this first group is that there’s just a really low overall symptoms profile that has emerged.

The second group that we identified which was composed of 289 individuals of the original 1300, had primarily cognitive complaints with relatively low rates of depression and relatively low rates of hyperarousal. So this group experienced relatively severe symptoms of headaches, about half of them had severe headaches. Half of them had problems with forgetfulness. Again, poor sleep emerged as a complaint. Poor concentration was common, slowed thinking was common.

The third group that we identified is a primary psychiatric group. About 294 individuals in the sample fit into this group. As we see, we had relatively low cognitive complaints while we had a very high spike in hyperarousal. That was a big component. Then they also had significantly more depressive symptoms than either the good recovery group or the cognitive group. This group primarily was experiencing problems with sleep. And then they had a lot of post-traumatic stress symptoms. They experienced a lot of repeated memories of the event, a lot of repeated dreams, they felt easily startled. They were on guard. They often avoided thinking about the event and they’d feel upset when reminded of the event. So we see in this third group that there’s primarily a lot of post-traumatic stress symptoms and that \_\_\_\_\_ [00:24:54], that’s from the injury event itself, not necessarily from the event of caused the mild traumatic brain injury. It could have been from another combat-related incident that they experienced.

And then the fourth group we saw is the group are the symptoms that most of us think about when we discuss combat-related mild traumatic brain injury where it’s really this culmination of cognitive complaints, headaches as well as the depression and hyperarousal. So this group had the highest overall symptom profile across the four scales. They again experienced poor sleep is really common. But this group is also doing the concentration, irritability, they’re feeling distant and cut off, feeling on guard. They’re feeling easily startled. In contrast to the primary psychiatric group, they have higher levels of association depression compared to all groups, even the psychiatric group.

What we were able to do in this first step is basically show that hey different types of combat-related mild traumatic brain injury exist. Specifically, it looked like there were four distinct subtypes. The next step was to see if these groups actually differed on key variables. Was their demographic information variable? Does the characteristics of other traumatic brain injury vary? Were there any medical information, other non-TBI factors that could differentiate them? So we began to look at those.

So the good recovery group which again was 38% sample and had the lowest symptom profile. They had some interesting characteristics. They were more likely to be in the sub-acute phase of injury, so within three months of injury. So they’re presenting for treatment earlier than their other cohorts, than the other clusters, the other subtypes of mild traumatic brain injury. These individuals also tended to be inured later in the OIF, OEF conflicts. That’s important for two points. When we talked earlier how policy changes were put in place that allowed for better access to care and better identification of people who are at risk for mild traumatic brain injury through those mandatory events. So what this may represent is that the individuals that were injured later in their conflicts were identified at a higher rate, received earlier treatment and so they were entering TBI programs earlier in the phase of their injury. So this might represent and might explain why they have a lower overall symptom profile compared to our other groups. Also interesting is this group had more physical injuries and higher rates of pain medication. At first that might seem counterintuitive to you guys but there’s been a lot of work that’s been done primarily by Luke French over at Walter Reed \_\_\_\_\_ [00:28:12] who has shown that individuals who have more physical injuries tend to have lower post-concussive symptoms than their counterparts with a mild traumatic brain injury but no physical injuries. There are a lot of explanations of why that might be but if you think about it just from a larger perspective, if you have an amputation and you’re dealing with that recovery, you might be less concerned about mild forgetfulness so that might be one explanation. Even through it might seem counterintuitive at first, they’re finding that more physical injuries and higher rates of pain medication used were in this good recovery is very much consistent with other research.

The second group, the primary cognition/headache group which is about a fifth of the sample, again these are the attention, forgetfulness, headaches complaints, light sensitivity. This group actually had the second highest return to duty rate. And consistent with their low reports of psychiatric concerns, they also had the lowest rates of anti-depressant use. Interesting this group also had the highest rate of central nervous system abnormalities such as subdural hematomas. Now not everyone in the study had CT or MRIs so these are individuals a sub sample of the population that did but across the sample this was statistically significant in terms of the CNS abnormality rate being present.

Another fifth of the sample was composed of that primary psychiatric group with hyperarousal or dissociation/depression. This group had the highest rate of anti-depressant usage which is a nice external validation that this is this group’s primary problem. Also interesting again reflecting back on policy changes in OEF or OIF are these individuals tended to be injured earlier in their conflicts. They tended to be injured earlier between 2004 and 2007 in contrast to that good recovery group.

Finally, the fourth group which is the mixed presentation group which is actually our smallest group, again had the combination of both psychiatric and cognitive complaints. This group had the lowest rates of CNS abnormality at a rate similar to that of the primary psychiatric group. They had a high rate of anti-depressant use and a lot rate of pain medication use. Now interestingly they tended to have a delay in engagement in treatment. They also had the highest rate of return to duty percentage. So if you think of active treatment and guidelines for progressive return to activity, these individuals might represent those who did not report their symptoms immediately and were not identified and did not get treatment. They return to duty faster and did not get proper TBI education and perhaps did not get the resources that they needed to facilitate their care.

When we kind of wrap this part of the talk up, I want to highlight that we seem to have evidence which suggests that there are really four unique types of combat-related mild traumatic brain injury. Of those the majority, about 38%, had a relatively low symptoms profile even though they were seeking care for their traumatic brain injury in a TBI clinic. Psychiatric symptoms were very prominent and two of the identified subtypes, post-traumatic stress was really a notable feature, both in the mixed presentation group and in the primary psychiatric group. In contrast the neurological symptoms, so these sensory changes, the fibular changes, really had a minimal effect. They explained very little variants in identified the subtypes and it didn’t differentiate. None of the groups differed in their rates of neurological symptoms. They were all relatively the same and all relatively low when we compared them to normal population rates.

Now I want to take this to the next step and really talk a little bit about treatment implications. When we talk about TBI treatment, at least within the military treatment facilities within the DOD, we really have two kind of major approaches. It kind of begs the question going off the discussion of subtypes, the identification of subtypes of mild traumatic brain injury, does one size kind of fit all? One of the more prominent types and we see this in a lot of our larger military treatment facilities is the comprehensive pathway. Really in that system you have a multi-disciplinary treatment team composed of vestibular therapist, a physical therapist, occupational therapist, speech therapist, psychologist, psychiatrist, medical people that as a team evaluate a patient upon intake through a combination of \_\_\_\_\_ [00:33:36] intake, individual assessments. Every provider basically sees every patient and based off of that they have an \_\_\_\_\_ [00:33:45] team meeting and they’ve put together a comprehensive treatment pathway. I think really this is the gold standard of treatment.

But even though it’s the gold standard, it doesn’t mean that there’s not consequences or negative aspects about it. One would be cost. I mean this is a very expensive way to assess someone who has a mild traumatic brain injury. It is also very time consuming. Not only for the providers who have to see all these patients whether or not they may or may not need their specific discipline but for the patient. The patient is having to spend considerable time to see these providers and this is time away from their commands and this is time away from their family.

Other people have really placed arguments about whether there is an iatrogenic effect that may be present here. I mean if you have an injury and you’re having to see all these specialists, it does make someone wonder how severe their problem is. And if you’re seeing five providers and they all ask you every day how’s your memory, how’s your memory, how’s your memory. It’s not surprising that some of them might develop a memory problem that they may not have had before. So, it is definitely something that we need to consider when we talk about these comprehensive treatment pathways.

In contrast to those comprehensive pathways, many facilities especially smaller facilities, you have basically individualized symptom based treatment programs. In this situation, you’re having a primary care provider or maybe a practitioner who is the lead for this patient’s treatment and then as they see fit referring out for various specialization. So if someone has cognitive brain, they might send them to a neuropsychologist or to a speech therapist. If they have dizziness, they’ll get sent to \_\_\_\_\_ [00:35:47]. So based off that provider’s assessment of the situation, they’ll go ahead and make various recommendations about their treatment trajectory or treatment plan.

Obviously, the comprehensiveness of that treatment plan may be sacrificed. One typically in these settings probably don’t have as many specialty providers available to you. But you’re also asking one person to make all these decisions and that’s person’s training in things such as assessment of the vestibular problems may not be at a level where they’re going to be able to identify subtle needs. Or they may not be able to ask the right questions to determine if there really is a memory problem that is in play. So it ends up being very much reliant on the patient’s ability and willingness to report their symptoms and then that provider’s ability to interpret and make proper treatment recommendations based off of those symptoms.

So it begs the question now recognizing that there’s basically only four primary subtypes of treatment, are we able to find a happy medium? Are we able to development treatment track where not every patient needs to see every specialty service but based off symptomatology at intake, we can develop broad treatment tracks that meet the needs of most patients while maintaining the efficiency in the use of our resources.

When we look at potential treatment pathways, I can propose that we, based off the four subtypes, we can develop four treatment tracks.

So track one for example would be for those individuals that come in for evaluation that have relatively few complaints. Those individuals may only need basic TBI education, discussion of normalization of symptoms that they do have and how that is the common symptoms that most individual see especially when they’re coming back from a combat environment and some education about sleep hygiene. If you improve sleep, can you just improve their symptoms that they do have that brought them in for evaluation?

A second track can target the subtype of individual that primary cognitive and headache complaints. Again, TIB education is a stable. Sleep hygiene is a staple. Headache management, you need to bring in a neurologist in on the case to help with management of their headache. Cognitive assessment and treatment, use of a neuropsychologist and a speech pathologist or occupational therapist to help engage in cognitive training and cognitive rehabilitation.

A third track for that primary psychiatric group may include again TBI education, sleep hygiene, diagnosing a pattern. But we also probably don’t need headache management. We might not need cognitive assessment and treatment. But we probably do need in this third track is good mental health treatment, primarily for post-traumatic stress. I mean and it’s even a consideration whether that is something that should be happening within a TBI track or a TBI clinic or is that something that needs to be referred out to the primary and mental health services.

And then our fourth track that mixed cognitive mental health group. Again, you need TBI education, you need sleep hygiene and then you need the cognitive assessment, cross the headache management and then the mental health treatment that can take that comprehensive interdisciplinary treatment that we’ve probably seen in some of our gold standard facilities that provide that, all patients see all providers kind of model.

You might notice that on these four tracks I don’t have any physical therapy noted and we’re not giving the \_\_\_\_\_ [00:40:01] in other settings that is something that people have noticed. And that just reflects that data. That was not a variable that disseminated the subtypes. I think given that data, we’re probably still reliant on working off of patient’s self report or referring to physical therapy as needed when an individual has dizziness or balance problems as a notable complaint or something that is impacting their ability to return to duty.

So if we take these tracks and we think about our next steps. Really, we need to work on continuing identification of the subtypes. Do these subtypes matter? Are they important? Do they impact treatment? Do they impact prognosis? We’ve begun to do research on these questions and have done some primary analysis and what we’re showing is that when we look at outcomes from a multi-disciplinary TBI treatment program, so individuals that are assessed at intake in terms of symptomatology and then what their recovery, what their improvement in symptoms are at the discharge of that multi-disciplinary treatment team, we see that the primary cognitive group and the mixed presentation group seem to have better outcomes to those type of treatment programs in comparison to the low level group and the primary psychiatric group.

What it seems like is the TBI programs are good at treating cognitive problems or at least the ones that we’re looking at, are really good at treating the cognitive complaints. Those individuals are improving while those that have primary psychiatric complaints do not seem to benefit as much. Why that is you can make your own conjectures about. Now the low recovery group also doesn’t seem to benefit that much. They don’t seem an improvement and actually at discharge they’re reporting more symptoms. Explanations for that might be that they have low symptomatology or they’re underreporting at intake so they’re underreporting at discharge. That’s possible. But it also might be that their need of that treatment was lower. So if you already have low symptoms, if you’re already reporting normal complaints, you’re not going to get any better than that. That’s just what is a normal person’s level of complaints and so you could make the argument that they might not need that level of service. They might not need a multi-disciplinary treatment team.

So we’re continuing to work that out and see if identification of these subtypes has utility in outcomes and prognosis indicators. We’re also want to look at return to duty rates and disability rates. Do they have a better outcome, do certain types of TBI have a better outcome if we engage them in the VA system? Are there various biomarkers that we can use to differentiate them? We talked about how the primary cognitive group has a higher rate of CNS abnormality than our other groups. It is a relatively low rate because again not every one had those biomarkers or had a CT or MRI but it definitely opens up the window that hey maybe that subtype does have a higher rate. So maybe if we looked at their blood levels we might see higher rates of \_\_\_\_\_ [00:43:44], which are both blood based biomarkers for neurotrauma. Or maybe if we do DTI we’ll see more white matter abnormalities in these individuals compared to the \_\_\_\_\_ [00:43:56]. I think the next step would say if we imposed a treatment track kind of model, does that actually improve the efficiency and the outcome of our patient population? And these are all questions that we want to work towards in the future.

So with that said, I want to go ahead and definitely acknowledge my coworkers on this and my co-investigators Dr. French, Dr. Lange and Dr. Brickell and Dr. Kennedy as well as my local research support and other co-investigators. At this point I’d really be happy to take any questions that the group might have and hopefully go forward from that.

Molly: Excellent. Thank you so much. Do you want to go ahead and leave up the acknowledgements slide or you can even add one with your name and e-mail if you’d like too? For our attendees that want to submit a question or comment, I know a lot of you joined after the top of the hour, to do so just use the question section on the go to webinar control panel on the right-hand side of your page. Click the plus sign next to the word questions. That will expand the dialogue box and you can then submit your question or comment there.

The first one that came in, what are your thoughts about the idea of requiring or providing pre-deployment neuropsychological testing to provide a baseline of cognitive functioning against which to compare post injury cognitive performance?

Dr. Jason M. Bailie: That’s a really good question and there has been a lot of debate within the neuropsychological community about that and whether there is utility. Within the DOD we utilize the ANAM and there is predeployment, postdeployment ANAM testing that’s done. The ANAM has definitely some utility in terms of its ability to detect change or detect abnormalities. I think the best situation that you have and other companies have done this too such as impact is if you have a good baseline and you have a valid measure with good reliable change \_\_\_\_\_ [00:46:16], that can definitely be useful for looking at cognitive changes in the acute period from the traumatic brain injury. So if we have an individual and you’re seeing them within 72 hours of assessment if you administer a measure such as the imPACT or the ANAM so that you have a baseline, you’re definitely going to have a better ability to identify any changes in cognition that you would in absence of that measure.

Now I’ll say two caveats. One the utility of those measures outside of say seven days seems poor and I’d also say that it’s not a measure of concussion. It is a measure of cognitive abnormality that may be related to a concussion. But if you have someone let’s say that has an injury, has a head injury but maybe doesn’t have a concussion, but they’re having poor sleep and a poor psychological reaction to that injury, let’s say they were in a car accident and they’re having a lot of nightmares and a lot of distress from the psychological trauma of that car accident, they could do really badly on say a test like the ANAM. So there’s a lot of reasons that someone might fail or have a decrement in performance from their baseline on a computerized assessment or other neuropsychological tests that have nothing to do with a concussion. So those would be my thoughts on that.

Molly: Thank you. The next question, are there any specific treatment strategies beyond 2016 guidelines under investigation?

Dr. Jason M. Bailie: Yeah, actually I can speak specifically about … at Camp Pendleton we have two treatment protocols that are currently underway that are under investigation. We’re looking at right now, we’re evaluating a lot of \_\_\_\_\_ [00:48:19] Fort Bragg and Navy Medical Center San Diego, the utility of corrective return to activity guidelines that were developed for the military in helping to have a progressive return to activity following concussion as opposed to less structured treatment as usual which has been the case for the majority of times. We’re investigating whether that is a useful treatment modality. We’re also looking at some novel kind of rehabilitation strategies. I’ll plug Doug Cooper who just recently published in JAMA the SCORE study which looked at the usefulness of speech therapy and traditional kind of individual cognitive therapy in contrast to computerized cognitive rehabilitation and that publication just came out I think last month or the month before.

Molly: Thank you.

Dr. Jason M. Bailie: There’s definitely across the DOD a lot of new treatments that are being investigated.

Molly: Great, thanks. Have you or do you plan to look at the embedded validity measures in the NSI, Vanderplug et, al?

Dr. Jason M. Bailie: Um yes. So that’s a great question. Definitely Dr. Vanderplug and actually I’ve been a part of some of the studies looking at the m bias as well. We chose not to use that because of it’s poor specificity. It has some limitations of the measure. And we did not feel that it … actually when we did look at it, it did not change our results dramatically so we chose not to exclude patients based off of it because a large number of individuals were excluded based off that measure. So we did not choose to. But I would be really interested in looking at it in more comprehensive maybe independent validity tests to see if that has an effect. Specifically, in some of the groups such as the mixed presentation group where you see a very high, and some elevation, I’m sure there’s some individuals in there that may be over reporting. Definitely the odds would suggest that is the case.

Molly: Thank you. How do you handle patients who perceive themselves as being impaired and don’t pass validity measures during neuro psych testing?

Dr. Jason M. Bailie: That is also an excellent question. You know I think that there is a lot of again … controversy about that. I can speak my personal approach to it is to … when I notice someone that is not doing well on validity tests for example, like let’s say I gave them a \_\_\_\_\_ [00:51:40] and they scored below rates, instead of just discontinuing the testing all together, I will go ahead and talk to them and reinforce the importance of giving good effort. Really I actually use all the explanation that it’s like an MRI. So if you’re moving in the MRI, there’s going to be too much fragments and they’re not going to get a good, clean picture so we’re not going to be able to tell if there’s anything wrong. And the same thing. If you’re not giving us good effort, we’re not going to get a clean picture of how your brain is functioning to help you. So often times I feel like motivation in those individuals is not necessarily secondary gain but there is a lot of … they do want to demonstrate they have problems and so if you validate that you want to help them, that you want to identify if there are any problems and you want to help to identify that, I just find that is a good technique to help improve engagement and good old-fashioned rapport. Like if they trust the provider, I feel like our rates of symptom validity test failure go down.

Molly: Thank you. Let’s see, do you have correlation data on pre-military psychiatric status and the psychiatric status and the psychiatric SX group? Sorry I don’t know what SX stands for?

Dr. Jason M. Bailie: Oh symptoms. So I think the question is do I have information that would suggest that the psychiatric subtypes has a higher rate of premorbid psychiatric problem. I don’t have that data but I think that’s a great question and I think that would be a great way of externally validating the subtype. I mean we definitely know that persistent post-concussive symptoms a major risk factor for who develops persistent post-concussive symptoms is a history of premorbid psychiatric conditions such as depression. It would make sense that that group would have it. That might explain their atypical reaction.

Molly: Thank you. What is the treatment provided for the advanced treatment response early in combat arena?

Dr. Jason M. Bailie: So in those situations in those clinics, that is … I was never there so I’m basing it off of … I’m a civilian so I’m basing it off of what I’ve been told. But it basically ran like an outpatient concussion clinic, how they’re run today only it was in the green zone. So patients would be evaluated and they would have various providers and specialization so such as sports medicine and PT and OT and speech and they would basically be guided through a progressive return to activity protocol much like they do in the sports world where they would return someone to activity when they were symptom-free with physical exertion showing that they have a good recovery.

Molly: Thank you. When doing this research, did you assess personality and IQ of those individuals who ended up in combat instead of becoming a medic, IT, warehouse, etc.? Is educational level a factor?

Dr. Jason M. Bailie: You know I don’t have that data but I think the question is referring to selection bias and to who joins the military. That’s something I really can’t address directly.

Molly: Yeah, sorry. I’m going to interrupt. They wrote in clarifying. Did you consider motivation … no, never mind. Go ahead.

Dr. Jason M. Bailie: Yeah, so I’m going to … I think that the premorbid factors are really important. So I think things like resiliency for example would be a very important factor that would determine perhaps what makes up the subtypes, including previous TBI history. I really would be interested in previous TBI history, lifetime TBI history in terms of those factors. But yeah, I believe there is a lot of different components that might determine which individuals … I will actually go back to Grant Iverson kind of biopsychological social model or bio psycho social model of post-concussive disorder. No, really there is just a host of factors that all coming together helps determine how someone recovers from a mild traumatic brain injury. And all those factors definitely should be investigated when we’re looking at these various subtypes.

Molly: Thank you. Do you see any use for using processing for sleep disorders or nightmares? Sorry, I’m sure I’m mispronouncing that.

Dr. Jason M. Bailie: Processing?

Molly: P-R-A-S-O-C-I-N

Dr. Jason M. Bailie: You know I’m not familiar what that.

Molly: Okay. It’s fine.

Dr. Jason M. Bailie: I would be happy to accept it if someone has a clarification on it.

Molly: Yeah, they’re more than welcome to write in a clarification. Did the study investigate exaggeration of cognitive symptoms versus malingering? If so, what were some of the findings?

Dr. Jason M. Bailie: Yeah, you know unfortunately we didn’t have the ability to look at \_\_\_\_\_ [00:57:41] in validity. As you mentioned before, we did look at the m bias briefly but that didn’t seem to be a good way of approaching the problem so. So the short answer is no.

Molly: Thank you. We did have a couple very kind attendees who wrote in to help me with that last question about the medication. [laughs] It’s pronounced Prasocin and it is used

Dr. Jason M. Bailie: Oh Prasocin, okay.

Molly: Prasocin. I still didn’t get it right.

Dr. Jason M. Bailie: That’s okay.

Molly: And it’s used for PTSD related nightmares.

Dr. Jason M. Bailie: Right. You know we don’t have that information so I don’t know if someone was on Prasocin for … I don’t know. That’s a beta-blocker so it helps decrease audit on the system arousal and so it would be a frontline treatment for our psychiatric group. Given the fact that post-traumatic stress symptoms were so high in that cohort and anti-depressant use was so high in that cohort, maybe these individuals were engaged in mental health treatment. I’m going to say that probably a substantial amount of them were taking medication like that but I don’t have the data to address it.

Molly: Thank you. And just one final question for you. Did you consider motivation for joining the military in your research?

Dr. Jason M. Bailie: No, you know we don’t have that data. You know that’s such a hard thing to conceptualize too why would someone who \_\_\_\_\_ [00:59:19] join the military. So yeah unfortunately I don’t a way of addressing that.

Molly: No problem at all. Would you like to make any concluding comments or wrap up with anything?

Dr. Jason M. Bailie: Oh yeah, I definitely look forward to the next generation of research on this and I’m really excited about it and I feel there’s definitely a lot of opportunities for us to better understand not only our diagnostics and assessments to use but also our treatment of them and so I really appreciate the audience and I hope that you all learned a lot and were able to take at least something away from it that you can help in terms of your work.

Molly: Wonderful. Well, we thank you very much Dr. Bailie for coming on and lending your expertise to the field and of course to Dr. Ralph DePalma who organizes these TBI sessions and we do have more coming up so keep an eye on your e-mail for those. And thanks to our attendees for joining us. I am going to close out the session in just a moment. For our attendees, please wait while the feedback survey populates on your screen. It’s just a few questions but it does help us improve the program and improve previous presentations. So thank you once again everyone. Have a great rest of the day. Thank you, Jason. Thank you, Ralph.

Dr. Ralph DePalma: Thank you, Molly.