DePalma: It's a pleasure to have with us today the Chief Innovations Officer from the National Intrepid Center of Excellence at Walter Reed, who's going to tell us about the results of their diagnosis and management strategies at NICoE. It's a gallant effort that looks at now the six-month and now the 12-month results of their work. Dr. DeGraba?

Thomas DeGraba: Well, thanks so much for that kind introduction, Dr. DePalma, it's really great to be here today. Since the beginning of the conflict in the global war on terrorism, the Military Health System has endeavored to meet the challenge of developing an effective strategy to treat complex comorbid mission and combat-related traumatic brain injury and psychological health conditions. Today, it's my pleasure to discuss a model of care developed at the National Intrepid Center of Excellence and now utilized at ten network Intrepid Spirit Centers across the MHS that have leveraged an interdisciplinary, holistic, intensive outpatient program approach to maximize return to duty and improve quality of life.

As a disclosure, of course, the views expressed in this presentation are those of the presenter and authors of the paper and do not reflect the official policies of the Department of Defense or the US government; our objectives today are to briefly discuss the complexities of characterizing the service member population presenting with traumatic brain injury and psychological health comorbidities and talk a little bit about the congressional mandate for Center of Excellence within the Department of Defense. We also are going to be describing the principles of that holistic interdisciplinary intensive outpatient program that we developed as a proof of concept back in 2008, about two years prior to actually opening the program. And then the bulk of what we want to talk about today is really to present the data on the response to the treatment using an intensive outpatient model of caring for service members using multiple domain-specific outcome measures. In other words, trying to get a little bit deeper into the characterization of TBI more so than just mild, moderate, and severe, and utilizing that as a way of measuring recovery.

We also want to present the effects of the IOP implementation again in those multiple domains; but in addition to that, talk about the durability of this. In other words, as the patients are in the program and we see improvement, the biggest question is does that improvement sustain itself once they've gone back to their unit active duty and at operations?

I’m also going to give several examples that demonstrate the value of standardizing interdisciplinary care model in a network of TBI centers across the MHS and utilizing a clinical research platform of synchronized care so that the precision characterization of TBI enhances our ability to provide interventions that are specific to the service member presentation of clinical symptomatology. And then finally, just going to give a brief--make some brief comments with regards to implementing this model of care, as I said, of interdisciplinary care in the Defense Intrepid Network that is being stood up across the enterprise.

Forces both in training and combat operation result in the disturbance of the complex neural network of the brain designed to execute the performance of all human responses including complex motor tasks, cognitive function, and emotional regulation. What we have found throughout the course of the past two decades, that those things that we anticipated at the early part of the war--particularly after we went into Iraq in 2003, we had anticipated the severe head injury exposure, IED blast, penetrating head injury; what wasn't necessarily anticipated were the effects of repetitive concussive and sub-concussive events from acceleration, deceleration injuries, angular acceleration injuries, and blast wave propagation as a component of both training and combat operation.

Given the heterogeneity and the magnitude of the forces, the distance from the blast, the frequency of repetitive events makes it challenging to quantify the exposure throughout the service member's career. However, we can access this information; and as we do so, our goal is to both try to identify those exposures throughout their career and relate them to the complex clinical conditions of TBI and psychological health issues. With regards to exposure to both TBI and operational stressors--when I talk about operational stressors, I’m talking about everything from [00:06:00] buddies in the theater of operation.

Coordinator: Dr. DeGraba, you are cutting out a little bit. Can you hear me? Dr. DeGraba, your audio is cutting out. Can you say a few more words? Okay, I think it's back to normal now. I’m sorry. Continue. It was just cutting out for a bit.

Thomas DeGraba: \_\_\_\_\_ [00:07:06] cognitive bandwidth, inability for service members to optimize their performance; it's also characterized by disruption of the autonomous nervous system with an imbalance in the sympathetic and parasympathetic function. Given the clinical consequences of blunt and blunt forces, \_\_\_\_\_ [00:07:34] depression and anxiety. So, the question was is how do we address that issue? Particularly as we try to treat those injuries that became known as the invisible wounds of war.

In 2007, Blue Ribbon panels to address TBI post-traumatic stress and suicidality provided guidance for The National Defense Authorization Act of 2008, which directed the Department of Defense to establish a comprehensive plan for programs to prevent, diagnose, treat, and rehabilitate service members with TBI post-traumatic stress and other mental health conditions to the fullest extent possible. The Intrepid Fallen Heroes Fund stood up and took an approach where they took the gifts from the American people to create a center that would allow us to be able to develop a program that would be a game-changer. The Secretary of Defense, Gordon England, at the time accepted that gift from the Intrepid Fallen Heroes Fund, and particularly from the American people themselves, to build NICoE which it envisioned to be the premier diagnosis treatment and research center for TBI and psychological health, and our center opened up in June of 2010.

In addition to that, since that time, ten other sites across the MHS have utilized this model of care and provided care for the service members with these complex wounds of war.

Now, in addition to the challenge and the difficulty of quantifying the forces that result in brain injury, there's also the challenge of kind of the current classification and outcome metrics. Up to the point in which we created the program, most of TBI had been characterized as either mild, moderate, or severe, and the outcome scales used, like the Glasgow Outcome Scale E, also had a relatively coarse paradigm in which it declared whether the outcomes from injury and recovery has had been declared.

The National Research Action plan in 2013 really focused on three key functions. First, they wanted to develop a more precise system for TBI classification, have a better understanding of pathophysiology so we can implement pharmacological and non-pharmacological interventions, and developed predictive markers of recovery and outcomes. So, the interdisciplinary model was designed because currently--or at the time--to establish a paradigm that would change conventional healthcare model that had been utilized in complex cases; up to that point, conventional healthcare had utilized the concept of a referral model from PCMs for specialists. The problem with the system the way the way it was is in complex patients, it risked the fragmentation of delivery of care, even though a level of excellence of the specialists themselves were good as they treated patients, a reductionistic view of medicine that related to specific and individual symptomatology without being able to combine therapies to give a comprehensive treatment plan, reduced the effectiveness of this model.

So, as a proof of concept, we used a holistic patient-centric interdisciplinary approach, a four-week program, though it can be utilized in modified outpatient settings. In this particular case--and I’m going to talk about our current program and the study that we're going to be discussing today--all service members are referred by their primary care providers; these service members have chronic and persistent symptomatology from TBI and behavioral health conditions that are not responding to conventional therapy. The team at NICoE would then conduct an intensive chart review even prior to the service member showing up; on the very first day of interdisciplinary care, there would be an interdisciplinary intake in which a core team made up of a primary care provider, a neurologist, psychiatrist, neuropsychologist, family therapist, and a nurse specialist who serves as kind of a touchstone for the service member throughout their four-week program; the patient is at the center of team care and that enhances that patient-provider rapport and allows the ability to more efficiently be able to identify the goals for recovery as well as providing immediate feedback of the responses to treatment.

In addition to that, the Intrepid Fallen Heroes Fund and the Fisher House created a house specifically for those service members coming through the program, so they could actually house together and create an extended therapeutic milieu as part of their stay on campus here at Walter Reed. Family members are also encouraged to come to the program and attend in the fourth week, and it allows them to be able to understand the skills-based training that was provided, education, and the strategies utilized going forward after discharge to help with continued recovery.

Finally, the program also, with this four-week program, had what we consider to be extraordinarily significant warm handoff and which was a session led by our team lead as part of the core team; and then also had on the line the home team primary care provider, case manager if available, the service member themselves, and their spouse to be able to assure that those things identified at the NICoE and the treatment plan that was created by a 17-discipline group, allowed us to be able to hand these patients off with a treatment plan that can be followed once the service members left the program.

The four-week intensive program more specifically utilizes a traditional rehabilitation neurological behavior health treatment model combined with an integrative medicine intervention and skills-based training. By having a co-localization of a team comprised of 17 disciplines, they're able to leverage that expertise to expedite diagnostic evaluations and to build on each other's expertise to achieve those common goals and develop a collaborative care plan that was individualized for the patients. The rehab also itself developed the skills-based training for self-efficacy and education for self-advocacy.

The service members can then also take advantage of the fact that there is, within this proof of concept, a co-location of capabilities that allows kind of a high-touch and high-tech capability so that we can utilize the latest technologies such as neuroimaging, magnetoencephalography, transcranial doppler, sleep studies, vestibular audiology, and ophthalmologic testing to be able to drill into some of the more objective outcome metrics of care that we see in this patient population. But in addition to that, we utilize a high-touch capability in which creative arts is used to address fragmented trauma memories and externalization of those demons and triggers that are causing their service members from being able to recover. Wellness techniques as well help with resetting the control of autonomic imbalance, which will help with reducing the exacerbating emotional dysregulation that we commonly see in service members with TBI and operational stressors.

The four-week program is a quite robust and schedule-intensive program; service member schedules are designed around the service member themselves as opposed to the other way around, instead of having providers having a schedule and having people show up for their for appointments with them, we take a look at the patient need based on what their symptomatology is, provide a standardized aggressive assessment in the first one to two weeks of care, and then begin to tailor the treatment response over the end of the second week, third weeks, and fourth weeks. With that ability to schedule the patient within that model of care, we're able to achieve anywhere from 105 to 135 total clinic and provider encounters for the service members in that four-week period. The sequencing, however, is really the thing that's most critical.

We created the program that develops the ability to address this aggressive and very intensive program by setting up three-goal sets. The first goal set is to establish a safe and trusting environment for the service members to engage in; we also upfront engage in improving sleep and pain because if we don't address those issues upfront, the remainder of the care paradigm becomes significantly reduced in its effectiveness. The second goal set relies on the patient-centric approach that facilitates the self-identification of physical and existential injuries resulting in post-concussive symptoms that stop the service member from returning to peak work performance and from improving their interpersonal relationships. The third goal set provides skills-based training and education to achieve self-efficacy and self-advocacy once they return to their units and to operations in combat and training.

For the study, we wanted to assess the efficacy of the outpatient program--the Intensive Outpatient program--by obtaining pre-post program evaluations utilizing seven validated scales: the Neurobehavioral Symptom Inventory; the PTSD Checklist Military; the Satisfaction With Life Scale; the Patient Health Questionnaire-8--and 9 while they're in-house--the GAD-7, Generalized Anxiety Disorder-7; Epworth Sleepiness Scale; and the Headache Impact Test. This is done to be able to more precisely define and identify those deficits utilizing the self-report scale in domain-specific outcome metrics in neurological and behavioral health conditions.

Critical to that as well is to take a look and be certain that we are able to look at those service members in each of those in self-report scales to look at the symptomatic range; in other words, we're looking at those patients who meet the threshold or above of having disorder in each of those scales. And so, we utilize, as you can see on the right-hand side--the NSI does not have a composite threshold, but PCL-M above 35 was used; Satisfaction with Life ≤ 19; PHQ-8 > 5; GAD-7 > 10, Epworth > 10; and Headache Impact Scale, those who are at 50 and above.

The scales were obtained at admission and at discharge, and the patients consented to have electronic versions sent out at one month, three months, six, 12, 18, and 24 months following discharge to be able to follow their recovery profile. We also want to make sure that as we measured the outcomes, that the outcomes themselves were focused on clinically-significant changes; and so, again, utilizing the literature, identify those thresholds that were deemed to be validated to be consistent with clinical improvements as we see here on the right-hand side of this slide. Again, greater than a five-point change for the NSI, and you can see the rest of the scales below where the service member had to reach at least those points or above to be able to be deemed clinically significantly improved.

So, the demographics of the patients. Remember, all service members entering the program were invited to participate in a database protocol which allowed us to be able to use the acquisition of all the data captured prior to NICoE during their visit at NICoE and after they've left, to be able to utilize that information related to TBI and psychological health issues. Over 91 percent of the service members coming through the program consented to the study. When you look at the study population, we have 1,456 service members during August of 2011 through February of 2019 who participated in this study were part of the analysis group; as you can see, the mean age of 38--a little over 38 years--and 98.4 percent male; the amount of time in service, over 17 years--so, again, this was a population of service members who have extended career exposure to blast and blunt force trauma as well as operational stressors; number of deployments, 73 percent of them had greater than four deployments and you can see the branches of service that the service members were in; the majority of service members--almost 80 percent--were enlisted; 20 percent officers; and the number of TBIs that were designated in these service members or identified these service members averaged seven events in their careers utilizing the VA DoD criteria for TBI.

We also took a look at TBIs and quartiles, and we'll see that in just a little bit as we tried to take a look to see if number of head injuries had an effect on the recovery profile of this patient population.

In the patients that we had come through, of 1456 patients, 26 were not able to complete the admission assessment, so that brought us to 1430; and we wanted to make sure that all people included in the study had full sets of self-report scales, both admission and discharge, which allowed us to look at 1271.

At one-month follow-up, 198 service members completed their surveys; at three months, 146; and at six months, 133 service members returned electronically-submitted surveys to be able to look at their outcome recovery.

Following the four-week IOP, patients whose symptoms severity was at or above the threshold at admission showed a significant clinical improvement at discharge in all seven self-report scales. And as we look through this again, these service members' improvement profiles were showing improvement not only in individual outcome metrics, but our intent is to identify a composite of recovery to help those service members who will return to active duty.

In addition, we also took a look at patients regardless of presenting symptoms and showed improvement across, again, all seven domains measured by the self-report scales. So, again, if you take a look, for example, at the PCL-M, again, significant improvement in those who presented with symptoms above 35 on the PCL-M; but even those who had symptoms of post-traumatic stress, that the overall score did not reach that threshold, still saw reduction of scores with the utilization of the intensive outpatient program.

In addition to that, we wanted to take a look to see whether or not having a number of different head injuries might change the recovery trajectory. And what we found was actually that when we looked at the first quartile--in other words those service members that had three or less head injuries--versus the fourth quartile in all domains, what we found was that with the exception of the NSI in which those who had a high number of TBIs who had a significant reduction in their NSI score, all the rest of the scales identified that service members with high and with low numbers of TBI had no difference in their recovery profile; so, in other words, those service members who are chronic in their symptomatology, who have been exposed to a variety of different head injury profiles does not reduce their ability to be able to recover providing the interdisciplinary care model that we utilized in their four-week program.

In addition to that, we then took a look at the outcome metrics at one month, three months, and six months. And what, again, we identified that in all outcome measures, service members had a persistent reduction of symptoms in the NSI PCL-M, Satisfaction with Life, GAD-7, depression scale, and sleep scale in our patients. Only the HIT-6 did not demonstrate persistence in recovery from the admission scores at three months and at six months; but all the remainder one, three, and six-month recovery data again demonstrated persistence of improvement during their time at NICoE and once they left the program.

To address the issue of bias, one of the things that we are concerned with is that those who respond to electronic reports may be those service members who did the best at NICoE; and so, to address that issue, we took a look at those service members who came through and had clinical improvement in each of the domains and compared them to those who did not have clinical improvement and looked at whether or not it made a difference at who responded at one month, three months, and six months. And what we found is that in all domains, there was no difference in those who had clinical improvement versus those who did not have clinical improvement with regards to the percent response in the one, three, and six-month range.

So, if we take a look at the NSI, 16 percent of those respondents were clinically improved; 14 percent of those who did not clinically improve at the time of discharge also responded. Again, no difference at three months, 12 and 8 percent; and at six months, 10 and 12 percent. Overall, the average follow-up rate was 15 percent at one month; 11 percent at three months, and 10 percent at 6 months, again identifying those service members who both clinically improved and did not have similar and no statistically-significant difference in the response rate following discharge.

In addition to that, we wanted to take a look at whether or not being enlisted or officer also had a benefit in recovery. And what we really found, particularly over the six-month period in all domains, recovery in both the enlisted and officers were the same with regards to the recovery particularly at six months; only at the one-month period in the PCL-M was there a difference where the officers had a trend towards toward improvement over enlisted, but all the rest of the scales throughout that timeframe showed no difference between enlisted and officer recovery.

Study limitations of this. The main one is that there is not a control group; those service members who were referred to NICoE were put into the schedule and into the program as soon as we could put them in. There also was the limitation of the percentage of follow-up. Now, from a standpoint of those not having to control, one of the concerns would be all these patients on a trajectory of recovery, and what we looked at was those patients who were coming to us, we looked at their pre-NICoE profile with regards to symptom persistence; those service members who came to NICoE were sent because they were not improving or were worsening with their symptomatology of TBI and PTSD depression anxiety, so they were either stable or getting worse which was why they were referred by their primary care physicians.

As for the limitations and the percentage of follow-up, again, that's always the long pole in the tent, is to optimize that capture of information though the numbers were statistically significant, future goals are to identify ways in which we can enhance that data capture--and, in fact, we have now data up through 12 months with regards to recovery time and recovery of all symptoms complex in that.

Alright. I’d like to take a few minutes to take a look at predictors of trajectory. So, the question is does model of care in which we have statistical standardized care, you look at what factors may be playing a role in recovery and risk for recovery in this patient population.

So, I want to highlight just two studies that we had looked at. One was a study done by Maegan Paxton-Willing, \_\_\_\_\_ [00:34:49] analysis factors involved in quality with regards to association with suicidality. What was found was very interesting: when you look at the sleep quality index and the Epworth Scale, there was a small association between poor scores and an increase in suicidality that was identified in Question 9 \_\_\_\_\_ [00:35:30]; that question provided us the ability to take a population--small in regards to the scales.

But if you took a look at particularly traumatic dreams related to combat-related trauma, what we found is that those who had significant frequency on a weekly basis of trauma nightmares had an increased odds ratio of 9.9 when related to suicidality. Given that information, it provides us guidance for the future of perhaps utilizing this question as a way of screening for increased risk of suicidality when we take a look at enhancing our practice guidelines and best practices in service members returning with TBI and behavioral health conditions.

In addition to that, we also did a study taking a look at art therapy. Now, art therapy is utilized predominantly in our center as a behavioral health tool where we allow service members to be able to explore a variety of demons and triggers, and externalization of those fragmented trauma memories that they otherwise do not express verbally. In this particular study, we looked at 370 service members and the design looked at, as in an observational study, the themes that were developed in masks that were created by the service members in their first week at the NICoE. The masks that are designed are those that are related to questions of, "What are those things that increase the difficulty of recovery in your history with traumatic brain injury and post-traumatic stress?" And the service members create an incredible number of images, and I’ll show you a few in just a second.

Looking at primary outcomes of correlation of different themes with post-traumatic stress, depression, and anxiety was our primary goal. When looking at the masks, there are a number of different themes that begin to emerge; we see themes such as patriotism, themes that demonstrate their injury; themes of death and grief--all of these are developed by the service members in the first week and are utilized to help the service member then begin to discuss with the art therapist, who is a behavioral health trained provider, to be able to start to discuss things that they otherwise, again, would not talk about unless they had created these images.

What was found was very interesting and what the study showed is those who had created images particularly of military symbols that they are proud of--in other words, a unit cohesion had the best improvement over the course of their four weeks in post-traumatic stress depression and anxiety; those who actually identified with having the use of fragmented military symbols as seen in Picture C here actually showed a greater challenge in recovery in post-traumatic stress depression and anxiety; and as well as those that have psychological and physiological injuries that are represented as part of their main theme of their masks, those service members also had an increase in inability to recover from their injuries.

So, again, these masks provide kind of that emergent pattern of resilience or risk that allows the server to begin to explore those things that are causing this; they're within their recovery of care and an externalization of these existential injuries for their recovery care plan. Again, since these service members are part of an interdisciplinary care program, this information that is able to be utilized by both the service member for self-identification of those problems are then immediately translated to the entire care team, which helps with the development of the creation of an individualized care plan that is directed towards those symptomatology events and issues that will hopefully help identify treatment paradigms that improve their recovery.

So, for future direction, again, when taking a look at multiple domain-related outcome metrics in this patient population, the question comes up: is there a hierarchy of symptomatology and hierarchy of disease state that may be able to be identified to help us understand the trajectory of recovery? Future directions also tell us that standardizations of recording assessment treatments and outcome metrics within the network, not just here but in our Intrepid Spirit Centers and other TBI treatment centers will provide the opportunity to be able to start combining larger data sets and having a better understanding of a population-based injury and identification of which treatments are the most effective in which patients' subpopulation based on their presentation of symptoms; identifying specific mechanisms will also help with improvement of identifying objective outcome measures so that we can use more than just those self-report scales; validations of response to trajectory also should be directed at the spectrum of traumatic brain injuries--in other words, time from last injury and severity should be playing a role as well as exposure to different head trauma forces that causes injury in our patient population.

And finally, utilizing a network model, we can start engaging in both retrospective and prospective research to rapidly advance clinical practices and to address management guidelines. A study initiative called the TRIP, or the Translation of Research in Practice is being designed to utilize the data that already exists across the Defense Intrepid Network and with goals in mind of doing prospective assessments to be able to identify best practices that can then be put into play across the MHS enterprise.

Let me just say a quick word before we conclude, about that Defense Intrepid Network. At ten different sites across the MHS, what we're identifying are now ten Intrepid Spirit Centers, eight of them have buildings thanks to the Intrepid Fallen Heroes Fund that, again, help with the co-localization of providers to allow for optimization of an interdisciplinary care approach at an Intrepid Spirit. Joint Base Lewis-McChord, Camp Pendleton, Fort Hood, Fort Campbell, Eglin Air Force Base, Fort Bragg, Camp Lejeune, Fort Belvoir all have centers. At Fort Carson and Fort Bliss, even though their centers are not yet completed, they are utilizing that interdisciplinary care model to do both intensive outpatient programs as well as modified outpatient programs that harness that capability and leverage the use of high-level expertise and specialists to be able to create cohesive care plans for service members with complex presentations.

So, in summary, the establishment of a clinical research center in TBI brain health allows us to be able to identify the standardization of a clinical platform for individualized care. In addition to that, that systematic collection of data helps us with that precision characterization of our patient population that will help us identify which treatments are most effective in that patient population. Again, the interdisciplinary intensive outpatient program demonstrated significant reduction in symptom severity and demonstrated the sustainability of outcome improvements in our service members; the use of those multiple domains provides us an opportunity to look at clinical significance in that patient population. And again, the granular longitudinal data allows us to start looking at predictive factors for improvement and return to duty. Our excitement within the network provides us the capability, as I said, to take a look at both retrospective and prospective studies in the future.

With that, I’d like to end with healing arts things that we find in our patient population to be extraordinarily helpful and our service members find to be incredibly enlightening. And so I’ll end with a bit of artwork that one of our service members has agreed to provide to us, and it says, "You allowed me to open up to you and communicate a burden I have carried for so long. Here is one more haiku:  bitter no more, dream of hope, freedom at last, changes forever." This service member population, many of them who have been career service members 15, 17 20 years’ time in service, had sustained a number of head injury and operational stressors throughout their career, and yet can recover from this; there is no time in which service members will not recover if they've had symptoms.

So, by saying people are going to plateau and not improve after a certain period of time and have to live with the new normal is not something that we have found; we have found that regardless of the amount of time and the severity in which our service members have these symptoms, the approach in utilizing this interdisciplinary care has been extremely helpful in putting the patients back on a trajectory recovery, not just for improving their quality of life but actually returning them to their units and to combat operations which many of them have high desire to do.

With that, I’d like to acknowledge my co-authors on the paper; it has been an extremely vigorous ten years of activity, nothing is done in isolation, it's a team approach and it's all about relationships between the service members and the providers. So, I thank the staff the National Intrepid Center of Excellence for their outstanding and unwavering care of this patient population; also for the NICoE informatics team that has provided us the ability to capture data not only at NICoE, but now has created a setting in which data can be captured at the intrepid spirit centers; our art therapy team that has developed an outstanding capability for our service members to be able to delve into those triggers and demons that stop them from recovering; and to Maegan Paxton-Willing and team for looking at sleep as one of the key factors that must be addressed to help with recovery of our service member population. And then finally to the Intrepid Spirit Centers directors and staff there who have taken that interdisciplinary model concept and molded it to their needs and their patient population at the Intrepid Spirit Centers.

And with that, I’d like to conclude this presentation and open up for discussion and questions. Thank you.

Coordinator: Thank you, Dr. DeGraba. We have a few questions lined up, so we'll just jump right into it. "Do all NICoE facilities share the same treatment model? For example, same availability of treatment, music, acupuncture...?"

Thomas DeGraba: Yeah, that's a great question. All centers have the same paradigm, not all centers at this time enjoy the ability to have for all providers in all disciplines; for the most part, the utilization of an integrative medicine approach using art therapy, using wellness techniques such as yoga, meditation, imagery, biofeedback, acupuncture is available at the majority of our Intrepid Spirit Centers; they utilize their staff to optimize the delivery of care.

People like to ask the question, "Well, which type of wellness is best? Is imagery better than yoga, better than meditation?" What we find is that the service members coming through will utilize a number of different and try a number of different wellness techniques, and actually identify those that are best for them; so,  the best technique for any individual is the one that they like and the one that they will continue to use once they leave the NICoE or leave the Intrepid Spirit Center to make themselves, again, self-efficacious in a resilience model over the course of time, and many of them have given us feedback with regards to that.

In addition to that, again, remember I talked about family members also participating. What many of our service members have told us is that they have utilized these relaxation techniques, particularly at the end of a long day when they come home, they've utilized couple's yoga, or meditation, or a family breathing or grounding technique to help to take the edge off the day, and then deal with the problems of the day as a team or as a family rather than as adversaries.

So, again, the model of care that we've utilized is actually something that does extend beyond the care at the centers themselves and are designed to provide that opportunity to make these patients self-efficacious.

Coordinator: Thank you. So, wondering if you have a sense of where these patients went after discharge from your program. Did many of them go back into combat versus separation from the military?

Thomas DeGraba: The majority of the service members coming through go back to their units and back to operations; we have a large number of our service members coming through our special operations, their whole goal is to come here for enhancement of their performance; in other words, taking a look at ways in which they can improve their skills and be able to do and perform their duties in their units as well as being able to go back to operational status. The majority of service members do that, it's one of the things that we believe reduces the return of the self-report scales that we send out in electronic fashion at one month, three months, six months, and beyond that they've already gone back to their units and are now re-engaged in training that makes it a little more challenging to respond to some of the emails that they get. But in fact, the majority of them do indeed go back to active-duty operations.

Coordinator: Thank you. "Can you identify which of the components of the interdisciplinary program are statistically improving the different outcome skills?"

Thomas DeGraba: Yeah, that is a great question and it is one of the key questions that we want to answer in the future. There is an extreme interaction among the different components of the presentation and symptomatology. So, when service members come in with high NSI scores or high PCL-M scores as well as disturbance with sleep, we know there's an extreme interaction among those different components; at this point moving forward, one of the things that we view as a future endeavor is to start looking to see which elements within that care plan has the highest effect on recovery in multiple domains, and so doing hierarchical cluster analysis and being able to try to identify which of these components.

One of the things that we found early on--and very early on--in the development of our program back in 2010-2011, was that sleep was a factor that needed to be addressed upfront because if we were unable to help them begin to improve their sleep, again, it was more challenging to have an improvement in other domains--or even being able to do assessments. Pain was the same way, it's why pain and sleep are in that first goal set, it's very challenging to do an assessment on neurocognitive functioning when someone has a 7-out-of-10 headache or is still getting three to four hours of fractured sleep per night. So, again, those are critical components that need to be addressed upfront prior to the assessment as well as treatments in some of these other modalities and other symptom complex events.

Coordinator: Thank you. "Is there anyone besides me that worries that we are diagnosing TBI based on reports that often change over time? I personally try to de-emphasize and focus on symptoms, so maybe it doesn't matter."

Thomas DeGraba: So, again, one of the things that we identified was that whether they had three two or three diagnosed head injuries or nine diagnosed head injuries, it really was the symptom complex that they present within symptoms severity that we had to address. And so, service members who had, as I said, in the first quartile and the fourth quartile with nine or more head injuries, had a very similar recovery trajectory. So, again, it harkens back to what you were saying that it is the symptom presentation that's the most important. It's the identification of the neural networks that are identified as being disrupted that's critical with regards to identifying, applying the correct treatment paradigms.

Now, that being said, there is a great deal of interest still in trying to identify the types of injury created by blunt versus blast exposure; I think there's value in understanding the quantification of those injuries particularly with regards to trying to optimize resilience in our service member population or to be able to determine when they might need withdrawal from intensive training for a brief period to optimize their overall training profile. So, I think that there is merit in understanding that, but it becomes extremely challenging when the self-report identification of the head injury is all that you have to work with because many times, service members don't remember the event itself and so unless you have witnesses providing more details into the injury, it becomes challenging to quantify the injury itself. I think there's merit to being able to understand that, we just need to try to figure out a way to do that.

Coordinator: Thank you. We have time for one more question; this is tremendous work, thank you. "As the teams gained experience, were there key lessons learned that changed the program during the project period? And two, would you have systematic longitudinal therapist ratings or other cognitive or functional performance measurements?"

Thomas DeGraba: Yeah, so there are a lot of things involved in that question. Let me just start off with things that we changed and identified. One of the first things that we actually identified in our program; we used to have the service members, when we first started, come in individually throughout the first week, seeing one or two patients per day. And what we found is that actually having the service members move through their four-week program as a cohort, so we have four to six service members coming in on a Monday and they go through the program as a team, that is far superior than having the service members come through individually. The utilization of that group cohesion is extraordinarily beneficial for the service members to begin to, again, externalize those fragmented trauma memories; it provides that capability of the unit--again, that unit cohesion which we have associated with a more rapid improvement in post-traumatic stress depression and anxiety.

We also had started off the program having the servicemember family and their spouse mostly come on the first week; and what we found was that, at the optimal time for them to come, because it's challenging for them to take off a lot of time, was actually to come in the fourth week once the service members had an opportunity to run through the program so that the family therapy aspect of the program is optimized; when the service member family comes in the fourth week, they're able now to sit down, be able to discuss and to externalize those things they weren't able to talk about before. It's one of the greatest challenges our service member population and their spouses have expressed is a lack of communication and lack of being able to share some of the traumatic events that they've experienced throughout their career.

Now, we've given them an opportunity to be able to begin to explore that, utilize those relaxation techniques to help them not to forget those memories, but actually to be able to address and respond to those memories without having the visceral response that they would commonly have without those relaxation techniques. So, again, the utilization of the family therapy capability once the service members have had the opportunity to be able to start processing that trauma, has been extremely beneficial in being able to make headway in the family therapy group.

And I’ll stop right there. If anyone wants to get in contact with me, I’ll be happy to kind of extend the opportunity, this session is over throughout the next couple of weeks, to be able to answer questions that weren't able to be answered during this session.

Coordinator: Thank you, Dr. DeGraba. So, we are just right after the end of the hours, we apologize for not being able to answer all your questions. I will compile all the questions that were unanswered and send them over to you in the next couple of days. Do you have any closing comments?

Thomas DeGraba: Our greatest goal with this mission--which is an incredible mission--is to be able to identify the optimal way of providing treatment paradigms and treatment care plan for this service member population; those service members, particularly who have extended careers, are presenting with these complex symptom persistence, and what we have found, utilizing that interdisciplinary approach has been extraordinarily effective as a provider that was utilizing conventional therapy in the first ten years of this conflict. Even though we had extremely outstanding specialists to be able to try to refer back and forth to, without having that capability of that interdisciplinary approach, we did not achieve the kind of success we're seeing in this patient population; and this model of care we believe, again, utilized throughout our current network provides us an opportunity not only to improve best practices, but also to provide a platform for future research to better understand the injuries and better understand the treatment paradigms.

So, with that, again, I thank everyone for listening and look forward to talking with you in the future.

Coordinator: Thank you so much. Dr. DePalma?

DePalma: Yes, I have one brief comment. If you want to learn how to take care of sleep disorders--which are important--our next webinar on May 4 will be on sleep disorders.

I’d like to thank Tom and everyone for hanging in there; we started with 167 listening in, so that's like a world record. We've lost a few along the way but listening next month to learn how to treat sleep disorders.

Thank you very much.